Madison Watershed Assessment Report

Dillon Field Office

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Madison River and Sphinx Mountain, September, 2009

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Assessment Process

This document reports the land health assessment of the public lands administered by the Bureau of Land Management (BLM) in the Madison Watershed (MW).

This is the first in a series of documents: the Watershed Assessment Report, the Authorized Officer's Determination of Standards, and the appropriate National Environmental Policy Act (NEPA) documentation and subsequent Decision(s).

The Watershed Assessment reports the condition and/or function of BLM administered land resources within the MW to the Authorized Officer. The Authorized Officer considers the report to determine if the five Standards for Rangeland Health (Standards) are currently being met, and then signs a Determination of Standards documenting where land health standards are, or are not, in compliance.

This assessment will report condition and/or function for the following five Standards:

- Standard #1 Upland Health
- Standard #2 Riparian /Wetland Health
- Standard #3 Water Quality
- Standard #4 Air Quality
- Standard #5 Biodiversity

The Standards are assessed on an allotment scale, with the exception of Air Quality, which is made at the watershed level.

In addition, this assessment will report condition and/or function for forest health and fuels. Forest health can affect each of the five standards, but in this assessment will be reflected under Standard #5 Biodiversity, along with other factors pertinent to biodiversity including Special Status Species and invasive species.

Condition/function declarations regarding the Standards are made as either:

- Proper Functioning Condition (PFC),
- Functioning At Risk (FAR); which is assigned a trend of up, down, static, or not apparent, or
- Nonfunctioning (NF).

Land Health Standards are met when conditions across an allotment as a whole are at PFC or FAR with an upward trend. This is dependent on scope and scale and determined by the Authorized Officer.

Reporting the conditions of the Standards will follow the following format:

- 1) Affected Environment - This section briefly describes the area and resources that were assessed.
- 2) Analysis and Recommendations - This section outlines the procedures the interdisciplinary team (IDT) used to determine conformance with the various standards,

lists the findings, and includes recommendations suggested by the IDT during the field assessments.

The Standards are described in detail in the Record of Decision (ROD) Standards for Rangeland Health and Guidelines for Livestock Grazing Management (S&Gs) for Montana, North Dakota, and South Dakota-Western Montana Standards. The preamble of the Western Montana Standards states: "The purpose of the S&Gs are to facilitate the achievement and maintenance of healthy, properly functioning ecosystems within the historic and natural range of variability for long-term sustainable use." Standards are statements of physical and biological condition or degree of function required for healthy sustainable lands. Achieving or making significant progress towards these functions and conditions is required of all uses of BLM administered lands as stated in 43 CFR 4180.1.

This assessment was done in accordance with the BLM regulations regarding Rangeland Health Standards.

- BLM Manual H-4180-1, Rangeland Health Standards Handbook and Guidance for Conducting Watershed-Based Land Health Assessments.
- Code of Federal Regulation 43 CFR, Subpart 4180
- Record of Decision - Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Montana, North Dakota and South Dakota.

Available trend monitoring data, existing inventories, historical photographs and standardized methodology are used by the IDT to assess condition and function of BLM administered lands. This information, including technical references, BLM policy and procedure handbooks, and monitoring guidelines and methodologies are available for review at the Dillon Field Office. Technical references and BLM procedural handbooks are also available on the BLM library website at http://web.nc.blm.gov/blmlibrary.

The initial recommendations developed by the IDT during field assessments contained in this report focus primarily on livestock management, timber and fuels management, wildlife and fisheries habitat and invasive species management. Other BLM administered public land resources, uses and activities addressed in the MW include recreation, cultural, travel management, wilderness, and special status species.

The assessed land health conditions and/or functionality are the basis for the IDT's management recommendations in this report and the Determination of Standards. As required by NEPA regulations, an Environmental Assessment (EA) will be completed addressing resource concerns identified within the 39 grazing allotments and on un-allotted or un-leased BLM administered public lands within the MW.

Alternative management will be analyzed wherever it is determined that:

- specific grazing allotments are not meeting the Standards
- allotments are meeting the Standards but have site specific concerns
- there are unhealthy forest conditions in the watershed
- fuels conditions are outside the natural range of variability
- there are other documented resources concerns

Also, if existing grazing management practices or levels of grazing use on BLM administered lands are determined to be significant factors in failing to achieve one or more of the five Standards, the BLM is required by regulation (43 CFR 4180.1) to make grazing management adjustments.

Implementation of new plans will begin in 2010, but it may take several years to fully implement revised grazing management plans, range improvement projects, forest treatments and/or fuels projects. The new plans will be developed in consultation and coordination with the affected lessees, the agencies having lands or managing resources within the area and other interested parties.

As with all similar BLM decisions, affected parties will have an opportunity to protest and/or appeal these decisions.

Background

The entire MW contains approximately 947,000 acres of BLM, private, State of Montana and Forest Service administered land. About 38,700 acres (4%) is public land administered by the BLM. Only BLM administered land was assessed for this document. Thirty nine grazing allotments contain about 30,729 acres of BLM administered land, including 1,874 allotted acres within the Bear Trap Wilderness Area. The Bear Trap Wilderness Area also contains 4,473 un-allotted acres. An additional 2,616 acres of un-allotted or un-leased public tracts are scattered throughout the watershed.

The MW covers a large geographical and highly variable topographical landscape (**Map 1: Madison Assessment Area, Vicinity Map and Allotments**). BLM administered lands are scattered from Pony, Montana south to Raynolds Pass on the Idaho border, and from Axolotl Lakes on the western edge of the watershed to the Madison/Gallatin county line on the lower Madison River.

Topography varies from grass covered terraces and benches adjacent to the Madison River to the high alpine forested slopes in the Tobacco Roots, Madison and Gravelly mountains. Elevations range from approximately 4,400 feet above sea level along the lower Madison to 11,300 foot Hilgard Peak in the Madison range. Vegetation in the watershed reflects the diversity of ecological conditions across the landscape. The dominant plant communities and habitat types change according to soils, precipitation, elevation, slope and aspect (directional slope alignment). A wide variety of vegetation is found from wetland and riparian obligate species, dependent on water and moist soils, to sagebrush and grass dominated plant communities that thrive on dryer upland sites. Forested habitats cover the higher elevations. The watershed's diverse landscape and vegetation provides habitat and structural niches for a variety and abundance of wildlife.

Current vegetative cover was calculated using satellite imagery (SIMPPLLE data). Table 1 summarizes the different cover types within the MW.

Table 1: General Cover Types Summary

Cover Type	BLM Acreage	% of BLM Acreage in Cover type	Total Watershed Acreage	% of Total Watershed in Cover Type
Forested	15,048	39%	313,518	33%
Grasslands	17,394	45%	372,139	39%
Sagebrush/Mountain Shrubs	4,369	11%	95,916	10%
Riparian/Mesic Shrubs	574	1%	30,549	3%
Mountain Mahogany	61	<1%	255	<1%
Aspen	929	2%	39,805	4%
Other	317	1%	94,747	10%
Totals	**38,692**		**946,949**	

The headwaters of dozens of spring fed streams and their tributaries originate high in the Tobacco Roots, Gravelly and Madison Mountain ranges and flow through a variety of landscapes and habitat types, most of which eventually drain into the Madison River. Two small streams in the Axolotl Lakes area drain into the Ruby River.

Average annual precipitation within the watershed varies from about 12 inches on the lower Madison flood plains to 40 inches on the high mountain slopes in the Beaverhead-Deerlodge National Forest in the Madison Mountain range.

In some locations the MW border follows BLM grazing allotment boundaries and includes some allotments that are only partially within the watershed. Technically, the MW is not one single distinct watershed. Watersheds are defined, and designated on maps, by natural topographical boundaries (ridgelines/drainages). Grazing allotments boundaries have been determined by previous BLM decisions and land ownership. These artificial boundaries may not follow topographical features. Therefore, some of the grazing allotments in the assessment area fall within one or more hydrologic unit or watershed.

The Dillon Field Office completed a new Resource Management Plan (RMP) in February of 2006. This document will provide program guidance in the Dillon Field Office for the life of the document, intended to be approximately 20 years. The RMP replaced The Dillon Resource Area Management Framework Plan (1979) and the Mountain Foothills Environmental Impact Statement (EIS) - Rangeland Management Program Summary (1981).

It is the BLM's intent to implement watershed management cooperatively with all affected parties. By working on a watershed basis, resource issues or concerns can be mitigated on a landscape scale. Any changes in livestock management will be implemented through grazing decisions that address one or more grazing allotments. Forest health and fuels management treatments or projects, noxious weed management, and any other management projects or changes will be implemented through appropriate program specific Decisions.

Prehistory and History

In conjunction with the Mountain Foothills Grazing EIS in the late 1970s, a Class II cultural resource inventory was completed for a 10% sample of lands within the Dillon Field Office. Results of the inventory located a mixture of prehistoric and historic sites throughout the watershed. The MW was occupied continuously from approximately 10,000 years ago until European contact, consisting primarily of small habitation and/or procurement sites (Earle, 1980). Various tribes continued to use the Madison Valley through European contact as a travel route to and from the Yellowstone area. Recent research within the Madison Valley suggests that various plants and animals were available in abundance to peoples occupying the watershed (Bergstrom and Deaver, 1993).

The MW was explored by fur trappers as early as 1810 when Andrew Henry, of the Missouri Fur Company, traveled up the Madison River from the Three Forks area into the headwaters of the Snake River (Chittenden, 1902). Originally, the Madison Valley was settled in 1863 when William Ennis built a cabin while resting his cattle after hauling freight into Virginia City from Colorado. As settlers moved west, they quickly discovered the economic benefits that the Madison Valley offered, specifically in that of cattle, sheep, and horse ranching (Madison County History Association, 1976).

Mining in the MW took place primarily in northeastern portion of the Tobacco Roots Mountains, in the vicinities of Norris and Pony. Lode mines in the Norris area were located in the late 1860s by miners who remained in the region after the initial Alder Gulch boom subsided. Production in the Norris Mining District lasted between 1864 and 1930, producing approximately $3,964,500. Mining began in the Pony District in the early 1870s and continued into the 1930s, with an estimate value of over $17 million in valuable ore being removed (MTDEQ, 2008a).

Special Management Designations

The assessment area includes one designated wilderness area, one wilderness study area (WSA), and one Area of Critical Environmental Concern (ACEC).

Bear Trap Wilderness

In October of 1983, Bear Trap Canyon became the first BLM administered land (approximately 6,000 acres) designated as part of the National Wilderness Preservation System when it was designated as the northern most unit of the 259,000 acre Lee Metcalf Wilderness. The large majority of the Lee Metcalf is managed by the Forest Service. A wilderness management plan was prepared and signed in November, 1984. That management plan was intended to provide direction for the 10-year period that ended in 1994. Although the plan has never been revised, the Forest Service completed an evaluation of the plan in 2004. The Forest Service review and the 2009 BLM assessment process have identified some resource concerns on BLM administered land within the Bear Trap Wilderness which are discussed under Additional Issues and/or Concerns.

Axolotl Lakes WSA

The Axolotl Lakes WSA covers approximately 7,804 acres recommended as not suitable for wilderness designation in the 1991 Montana Statewide Wilderness Study Report. That report stated, “The WSA has significant scenic value and wildlife features, and a diversity of primitive

recreation opportunities. Human imprints reduce the WSA's wilderness qualities significantly, however." Since no congressional action has been taken on BLM's recommendations, the area continues to be managed as a WSA in accordance with the *Interim Management Policy for Lands Under Wilderness Review* (IMP), (BLM Handbook H-8550-1). The IMP provides policy direction toward ensuring that wilderness values identified at the time of the wilderness inventory are not impaired until a final decision is made through congressional action on a wilderness bill. The IDT identified several resource concerns in the WSA which are discussed below under Additional Issues and/or Concerns.

Blue Lake ACEC

ACEC's are areas designated to protect relevant and important values and apply special management where standard or routine management is not adequate to protect the values from risks or threats of damage/degradation or to provide for public safety from natural hazards.

The Blue Lake ACEC is located 12 miles southwest of Ennis, Montana within the Axolotl Lakes WSA, is approximately 430 acres, and supports a population of neotenic tiger salamanders commonly referred to as axolotls. Special management for the Blue Lake ACEC includes not authorizing activities contributing to nutrient enrichment or increased water temperature in Blue Lake (e.g., livestock grazing, timber harvests, wheeled vehicle access) and no surface occupancy for mineral leasing.

Montana axolotl from Grassy Lake

Historically, "axolotls" may have occurred in all of the natural lakes in the Axolotl area. Today they are only found in two, Blue Lake and Grassy Lake. While not a true axolotl, (true axolotls occur only in Lake Xochimilco in central Mexico), these creatures exhibit nearly all the traits that distinguish true axolotls, such as a fully aquatic lifestyle, retention of gills into sexual maturity, limb regeneration and the finlike tail. The major difference between a true axolotl and the neotenic salamanders living in Blue Lake is that the "axolotls" in Blue Lake will readily morph into a terrestrial tiger salamander if its environmental conditions are improved, whereas true axolotls will not.

Wall Creek Wildlife Management Area

In 1959, the Montana Department of Fish Wildlife and Parks (FWP) purchased the 7,100 acre Holt ranch and established the Wall Creek Wildlife Management Area (WMA) to provide winter habitat for elk. All FWP WMAs are managed with wildlife and habitat conservation as the primary concern. WMAs protect important wildlife habitat that might otherwise disappear from the Montana landscape. They provide vital habitat for bear, bighorn sheep, birds, deer, elk, furbearers, moose, mountain goats, wolves and an array of other game and nongame wildlife.

The livestock grazing allotment management plan (AMP) was developed by FWP in cooperation with the Beaverhead-Deerlodge National Forest in 1987. The primary goal of the grazing plan is to keep upland plant communities in healthy and vigorous condition for the large number of elk that winter on the WMA (in excess of 2,000 head during the season's heaviest use periods). The BLM and FWP evaluated the five standards of rangeland health on public lands within the WMA in 1999 and found all five in compliance. In 2002, the BLM issued a grazing permit to the Wall Creek Stock Association to harvest 36 AUM's of forage on public land within the terms and conditions of the AMP as implemented in 1987. The system consists of nine pastures containing BLM, FWP and Forest Service administered lands. The pastures containing BLM administered lands are the three low-elevation pastures next to the Madison River. BLM administered land is a small percentage of each pasture. These three low-elevation pastures are used in a three year rest-rotation in conjunction with three mid-elevation and three high-elevation pastures. Each BLM pasture is used for 30 days every third May, for one week every third September and rested one in three years. The current AMP is an effective and appropriate management tool for maintenance and improvement of the upland and riparian resources on BLM, FWP and Forest Service administered lands within the WMA.

Authorized Uses

Forest Products

Forested resources in the watershed have been utilized since the beginning of European settlement during the 1860's. Evidence in the form of old stumps can be found throughout forested habitats in the assessment area. Extensive timber harvest occurred on the slopes of the Tobacco Root Mountains in association with settlement of the area and mining activities.

Recent forest management activities (timber harvests) on BLM administered lands occurred in the late 1970s and early 1980s in the Standard Creek drainage and Squaw Creek area in the Lower Madison. The Standard Creek Salvage Sale harvested approximately 40 acres, and was completed in conjunction with the Second Chance Timber Sale on Forest Service administered land. Approximately 220 thousand board feet (MBF) of predominantly dead Douglas-fir and lodgepole pine were removed in this salvage sale. A small component of live Douglas-fir and lodgepole pine were also removed. The Squaw Creek Salvage sale harvested approximately 290 MBF of dead and/or damaged Douglas-fir and lodgepole pine from 56 acres.

Livestock Grazing

The assessment area includes 39 grazing allotments covering 30,729 acres of BLM administered public land (**Map 1**). Thirty-one different business entities or individuals hold grazing authorizations on these allotments. Grazing allotments in the MW provide operators important late spring, summer and fall forage for their livestock. There are 3,848 animal-unit months (AUMs) of allocated livestock forage on BLM administered lands within the allotments. The stocking rate on BLM administered lands within the watershed ranges from two acres/AUM to 100 acres/AUM. This variance is influenced by soils, vegetative type, topography (aspect, elevation, and slope), distance from water and local weather. Cattle are designated as the "kind" of livestock authorized to graze 38 allotments, horses are authorized on two allotments, and indigenous species (bison) are exclusively authorized on one allotment. Livestock grazing allotments were assigned to a management category during the resource planning process. All

grazing allotments in the Dillon Field Office have been categorized as either *Improve (I), Maintain (M)* or *Custodial (C)* based on resource values, opportunities for improvement and the BLM's level of management. Allotment categorization is also used to establish priorities for distributing available funds and personnel during plan implementation to achieve cost-effective improvement of rangeland resources. Improve *(I)* category allotments are managed more intensively and are monitored more frequently. Maintain *(M)* category allotments are usually at a desired ecological condition and are managed to maintain or improve that condition. Custodial *(C)* category allotments are generally isolated parcels where BLM administered land is a small part of the total grazing unit, there is limited or no public access, and/or have few resource concerns. These small allotments are managed in conjunction with the lessee's normal livestock operation and monitored less frequently. ix allotments in the MW are categorized as *I* allotments, five are *M*, and the remaining 28 are *C* allotments. Table 2 summarizes grazing allotment information.

Table 2: Grazing Allotments Summary

Allotment number category	Grazing Authorization Number	Season of Use	Livestock Number and Kind	Grazing System	[1]Stocking Rate on BLM	BLM Active AUMs	BLM Acres	Acres in Other Ownerships	Total Acres
Aspen Creek #10540 (I)	2505793	05/15-11/14	11 cattle	Seasonal	10 acres/ AUM	67	683	1471 (Private)	2154
Axolotl Lakes #20485 (I)	2500116	06/20-11/18	245 cattle	Deferred rotation	3 acres/ AUM	406	2427	1858 (Private)	4296
	2505710	06/26-09/15	135 cattle	Deferred rotation		357		11 (Forest Service)	
Bar Seven #10457 (C)	2505710	05/01-02/22	50 cattle	Seasonal	5 acres/ AUM	345	1575	169 (State) 4016 (Private)	5760
Billie Mine Isolated #20403 (C)	2505810	05/15-06/30	46 cattle	Seasonal	3 acres/ AUM	69	192	490 (Private)	682
Carter #20386 (C)	2500189	11/01-02/01	3 cattle	Seasonal	10 acres/ AUM	9	91	0	91
Cliff Lake #10437 (C)	2505804	05/01-11/30	1 cattle	Seasonal	4 acres/ AUM	7	29	378 (Private)	385
Corral Creek #10543 (C)	2505797	06/01-09/30	3 cattle	Seasonal	34 acres/ AUM	12	405	0	405
Dehaan #20390 (C)	2505657	05/01-11/30	2 cattle	Seasonal	13 acres/ AUM	8	105	0	105
Easter #20393 (C)	2505660	05/28-02/28	15 cattle	Seasonal	7 acres/ AUM	137	1012	0	1012
Elmer #20394 (C)	2505661	07/01-10/08	21 cattle 2 horses	Seasonal	3 acres/ AUM	76	256	0	256
Flying D #20420 (C)	2505733	03/01-0610 10/16-02/05	7 indigenous	Seasonal	9 acres/ AUM	64	591	41 (Private)	632
Glen Kyle #20412 (C)	2505643	06/20-10/25	9 cattle	Seasonal	8 acres/ AUM	38	285	2 (Private)	287
Jourdain Creek #20410 (C)	2505689	06/06-10/15	5 cattle	Seasonal	21acres/ AUM	20	419	2024 (Private)	2443
Kelly Meridian #10539 (C)	2505793	05/15-06/30	22 cattle	Seasonal	6 acres/ AUM	32	178	1070 (Private)	1248

Allotment number category	Grazing Authorization Number	Season of Use	Livestock Number and Kind	Grazing System	[1]Stocking Rate on BLM	BLM Active AUMs	BLM Acres	Acres in Other Ownerships	Total Acres
Ledyard-McGuiness #20416 (C)	2502428	06/16-09/14	25 cattle	Seasonal	5 acres/ AUM	75	336	144 (Private) 323 (State)	803
Maltby's Mound #30402 (C)	2505804	04/01-01/31	5 cattle	Seasonal	6 acres/ AUM	52	289	416 (Private) 2712 (State)	3417
McAtee Bridge #10529 (I)	2500064	04/15-06/30 09/01-10/31	13 cattle	Seasonal	5 acres/ AUM	92	456	3546 (Private) 506 (State)	4508
Michel #20417 (C)	2505683	06/01-10/31	5 cattle	Seasonal	2 acres/ AUM	25	54	316 (Private)	370
Mill Creek-Gustin #10465 (C)	2505718	05/01-05/31	14 horses 9 cattle	Seasonal	9 acres/ AUM	23	202	1310 (Private)	1512
MVHPA #10550 (I)	2505652	06/10-10/20	7 cattle	Seasonal	17 acres/ AUM	30	519	0	519
North Indian Creek #10140 (C)	2505652	05/27-07/05	67 cattle	Seasonal	6 acres/ AUM	29	165	328 (Private)	493
North Meadow Creek #10380 (C)	2505647	05/20-10/19	27 cattle	Seasonal	8 acres/ AUM	136	1043	895 (Private)	1938
North Morgan #20423 (C)	2505667	05/01-05/31	11 cattle	Seasonal	15 acres/ AUM	11	167	1887 (Private)	2054
Parent Isolated #20406 (C)	2501600	06/01-10/30	1 cattle	Seasonal	13 acres/ AUM	6	76	541 (Private)	617
Pony Gulch Isolated #20405 (C)	2505810	07/01-10-30	7 cattle	Seasonal	13 acres/ AUM	28	371	1848 (Private) 15 (State)	2234
Preacher Creek AMP #20404 (M)	2505804	06/25-11/01	100 cattle	Deferred Rotation	6 acres/ AUM	124	753	1365 (Private)	2118
Red Bluff #00982 (C)	2500153	06/15-08/14	110 cattle	Seasonal	4 acres/ AUM	220	815	0	815
Revenue Commons AMP #20407 (I)	2501600 2505810	06/01-10/30 06/01-07/30	135 cattle 27 cattle	Rest-Rotation	6 acres/ AUM	283 65	2119	1838 (Private) 489 (State)	4446
Shirley #10436 (C)	2505700	11/15-01/04	32 cattle	Seasonal	10 acres/ AUM	64	665	355 (Private)	1020
Sitz #00438 (C)	2500186	03/01-12/31	2 cattle	Seasonal	8 acres/ AUM	18	150	2 (State)	152
Strawberry Ridge AMP #10421 (I)	2505643 & 2504687	07/01-09/14	305 cattle	Deferred Rotation	7 acres/ AUM	294	2020	2239 (Private) 383 (Forest Service) 439 (State)	3061
Sun Ranch Isolated #20460 (C)	2505070	05/15-11/14	4 cattle	Seasonal	14 acres/ AUM	24	344	0	344

Allotment number category	Grazing Authorization Number	Season of Use	Livestock Number and Kind	Grazing System	[1]Stocking Rate on BLM	BLM Active AUMs	BLM Acres	Acres in Other Ownerships	Total Acres
Trail Creek C&H AMP #30401 (M)	2505689	07/01-07/09 09/27 - 10/05	220 cattle	Split Season	25 acres/ AUM	83	2083	26 (Private) 6916 (Forest Service)	9025
Trout Creek #20496 (C)	2505746	07/01-09/30	12 cattle	Seasonal	100 acres/ AUM	3	301	317 (Private) 3 (Forest Service)	621
Wall Creek AMP #10522 (M)	2505774	06/01-09/05	150 cattle	Rest Rotation	4 acres/ AUM	214	810	858 (Private)	1668
Wall Creek Game Range #00819 (C)	2500027	05/01-06/02 09/23-09/30	33	Rest Rotation	13 acres/ AUM	36	455	0	455
Wallace Peak AMP ##10447 (M)	2505810	07/01-09/30	166	Seasonal	11 acres/ AUM	100	1096	1110 (Private) 596 (State)	2802
Willow Creek #10440 (C)	2500198	07/16-10/30	34 cattle	Deferred rotation	5 acres/ AUM	120	614	0	614
Windy Pass AMP #20385 (M)	2505687	09/01-09/14	200 cattle	Seasonal	18 acres/ AUM	46	840	455 (Private) 2 (Forest Service)	1297

Recreation

Recreation use within the assessment area includes relatively heavy summer use all along the Madison River, 3-season use (except winter) in the Revenue Flats, and throughout BLM administered lands during the big game hunting season. BLM also manages a popular recreational rental cabin overlooking the Twin Lakes in the north end of the Gravelly Range commonly referred to as the Axolotl Cabin.

The Madison River is a blue ribbon fishery and is one of the state's most popular fishing destinations. The river's exceptional fishery accounts for more than 160,000 annual angler use days (AUDs), and attracts fishing enthusiasts from all over the world (Montana Fish Wildlife & Parks, 2007). Within the MW assessment boundaries, more than 140,000 AUDs are recorded annually. River use includes over 180 commercial outfitters permitted under a cooperative agreement with Montana FWP. In addition, the lower Madison River from Warm Springs to Black's Ford is heavily used by float tubers enjoying the relatively warm water made possible by the Madison Dam and the thermal effect of Ennis Lake. The recreational tubers have become the dominant user of the lower river.

Mining, Minerals and Abandoned Mine Lands

The Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976 (FLPMA), and the Natural Materials and Minerals Policy, Research and Development Act of 1980 direct that the public lands be managed in a manner that recognizes the nation's needs for domestic sources of mineral production. Under the Mining Law of 1872, claimants have a statutory right to develop their mineral deposits consistent with applicable environmental laws.

The MW contains numerous areas of high mineral potential and known mineral deposits particularly in the area just east of Alder Gulch, the area west of Pony and the Strawberry Ridge area. These areas have seen many mineral exploration and development projects over the years, mostly for gold, silver and other similar minerals.

There are currently two active exploration Notices (43 CFR 3809) in the watershed. The first is west of Pony where an existing adit is being sampled for mineralization. The second is southwest of Harrison near the Sitz Ranch on a small isolated parcel where a new adit is being driven for sampling purposes. Both of these projects are bonded for reclamation. There are currently no active Plans of Operation on BLM administered land in the watershed. There are however, several small active and inactive operations in these areas of the watershed that are on lands not managed by BLM.

The mineralized areas of the watershed have seen extensive mineral development over the past 150 years. The BLM Abandoned Mine Lands (AML) program is responsible for cleaning up sites determined to be hazardous to human health, to the environment, or those which present physical safety hazards to the public. This program addresses mine sites abandoned prior to January 1, 1981, the effective date of the BLM's surface management regulations (43 CFR 3809) that implement the "unnecessary or undue degradation" provisions of FLPMA. Because early mining prior to 1981 did not require reclamation or bonding, many of these abandoned mines have legacy features such as eroding dumps, abandoned tailings, or open mine features.

The watershed has potential for salable material such as decorative stone, building stone, gravel and other commodities. BLM has no community pits in the watershed. Community pits are sites that are set up specifically for the sale of mineral material. There are also not any current exclusive sales of mineral materials in the watershed.

The MW is considered to have low to moderate potential for oil and gas. No exploration is known to have taken place in the watershed in recent years.

Uplands

Western Montana Standard #1: *"Uplands are in Proper Functioning Condition."*

Affected Environment

Uplands are defined as land at a higher elevation than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones (USDI 1996). Properly Functioning Condition (PFC) is defined as the condition in which vegetation and ground cover maintain soil conditions that can sustain natural biotic communities. Uplands function properly when the existing vegetation and ground cover maintain soil conditions capable of sustaining natural biotic communities. The functioning condition of uplands is influenced by geomorphic features, soil, water, and vegetation (USDI 1994).

The MW covers a large and diverse geographical and topographical landscape, and the upland plant communities include river terrace grasslands, mid-elevation sagebrush-grassland steppe

and high-mountain and ridge top forested habitats. Sagebrush steppe and grassland areas are considered uplands for purposes of this report. Forested communities and habitat are discussed in the Biodiversity section (Standard #5) below.

Changes in the total percentage of canopy cover on a given site may be affected by many interacting variables. Combinations of annual weather, natural plant mortality, grazing utilization, plant disease, insect infestations, wildfire, weed treatments, recreational use and other activities all affect ecological processes to some degree and contribute to changes (both positive and negative) to plant composition and vigor, soil stability, and biotic integrity.

Based on satellite imagery, 49% of the watershed is classified as sagebrush/mountain shrubs and grassland uplands (10% sagebrush-steppe, 39% grasslands). The variety, distribution and ecological seral (successional) stage of the plant communities in the MW uplands are a function of climate, geology, and soil combined with:

- historic uses (e.g. grazing, mining)
- short term weather patterns
- disturbance regimes (drought, fire, floods and herbivory)

Soils

The topography of the MW is comprised of several mountain ranges and associated intermontane basins or valleys. The mountain ranges were formed by complex faulting and uplifting and the valleys filled with sediment carried into them by streams draining the uplifted mountain slopes. The major streams occupying the basin bottoms were overloaded and could not carry sediment away as fast as it was being provided. In addition, volcanic ash and breccia were added to the excessive sediment loads. The resulting basin-fill material is a complex mixture of debris from erosion and volcanic material. Alluvium that blankets the flood plains and the lowest terraces adjacent the streams varies from fine-textured clay, silt and sand to more coarse gravel and cobble.

The Madison County Soil Survey shows seven different soil complexes located in the MW assessment area. They vary across the diverse topography from the nearly level to gently sloping flood plains adjacent the Madison River to the steep rocky slopes of the mountain ranges. In the uplands the soils are well drained, depths vary from shallow to deep and course fragment composition in these soils range from silty to sandy to gravelly material.

During an average water year the potential production of total vegetative biomass varies widely in the assessment area based on soils, altitude, aspect and precipitation. The shallow to gravelly soils located on the flood plains adjacent the Madison River only produce about 1,000 pounds per acre while the thin silty soils located in the mountains west of Pony can average about 2,200 pounds per acre. For more information on soils in the MW, refer to the Madison County Soil Survey.

Vegetation

As is the case across all landscapes, the upland plant composition in the MW is changing as the result of ecological succession. The natural progression from early seral stage plant communities towards a climax plant community is inevitable without disturbance. The spread of primarily

Douglas-fir and Rocky Mountain juniper can be attributed, in part, to the reduced frequency of wildfire which has changed the dominant plant species and habitat types on some of the BLM administered lands in the MW. Expansion of conifers is discussed in more detail under the Biodiversity section (Standard #5) below.

The lower elevations on the river terraces and benches in the Madison valley are dominated by grass and grass-like species. Cool season grasses on these ecological sites include bluebunch wheatgrass, Idaho fescue, prairie Junegrass, needle-and-thread grass, western wheatgrass and Indian ricegrass. Natural Resource Conservation Service (NRCS) ecological site descriptions specify that grass species should comprise 55-80% of total cover depending on relative site condition. Woody species on these sites frequently include mountain big sagebrush, skunkbush sumac, horsebrush and a couple of common rabbitbrush species. NRCS site descriptions explain that if any of these shrubs account for greater than 5% canopy cover, it usually indicates the site has been subject to some kind of past disturbance.

Much of the BLM administered rangelands in the MW are mid level (elevation) ecological sites in the vicinity of Norris and McAllister and on the upper benches and foothills in the Madison valley. Soils vary from sandy to gravelly and the annual average precipitation ranges from 10 to 19 inches. Plant communities and habitat types are primarily grasslands and sagebrush/grassland steppe. In climax seral state, composition by weight of annual production on these ecological sites is between 70 and 85% composition of grasses and grasslike species. Shrubs like sagebrush, rabbitbrush and snowberry account for between 5 and 15% of the annual production and forbs such as lupine, yarrow, phlox and pussytoes the remainder.

Several allotments in the MW are located on high elevation mountainous terrain in the Tobacco Roots, Gravelly, and Madison ranges. Upland rangelands are limited to open parks and relatively narrow high valleys and drainages adjacent to small tributaries. The relative dominance of the ubiquitous bluebunch wheatgrass and Idaho fescue may be reduced as other cool season grasses such as Columbia needlegrass, mountain brome and basin wildrye are present. Increased production of forbs and shrubs are also a common characteristic of these higher elevation ecological sites.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard

The uplands were assessed on an allotment basis according to Interagency Technical Reference 1734-6 *Interpreting Indicators of Rangeland Health*. This technical reference is available to the public to read or download on the BLM Library webpage, http://web.nc.blm.gov/blmlibrary. This qualitative process evaluates 17 “indicators” (e.g., soil compaction, water flow patterns, plant community composition) to assess three interrelated components or “attributes” of rangeland health: soil/site stability, hydrological function, and biotic integrity. The IDT visits specific ecological sites and rates each indicator on the degree of departure, if any, from what is expected for the site. The rating for each indicator is then weighed to determine the degree of departure of the three attributes of rangeland health.

The NRCS has developed Ecological Site Descriptions based on specific soil types, precipitation zones and location. They describe various characteristics and attributes including what vegetative species, and relative percentage of each, are expected to be present on the site. The IDT refers to these site descriptions while completing the upland evaluation matrix.

Members of the IDT visited all 39 grazing allotments, un-allotted and un-leased BLM administered land in the MW during 2009 and completed 19 rangeland health indicator evaluation matrices. In addition, Daubenmire trend studies established in the 1970s and early 1980s were duplicated in 2008 to help determine vegetative trend. The data collected was summarized and compared to baseline data providing supporting information for interpreting the upland indicators.

Table 3 outlines the findings from the completed upland evaluation forms. A moderate departure from expected conditions is analogous to functional at risk (FAR) rating (USDI BLM, 2005a). Upland sites are considered to be in PFC if they are in none-to-slight or slight-to-moderate departure from expected conditions.

Table 3: Upland Qualitative Assessment Summary

Allotment Name & Number	Ecological Site Name	Plant Association	Degree of Departure from Expected		
			Soil Site Stability	Hydrologic Function	Biotic Integrity
Axolotl #20485	Silty 15-19" Precipitation Zone (PZ)	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
Bar Seven #10457	Silty-limy 10-14" PZ	Idaho fescue/bluebunch wheatgrass	slight to moderate	slight to moderate	**moderate**
Billie Mine Isolated #20403	Sandy 10-14" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
Cliff Lake #10437	Silty 20-24" PZ	Sagebrush/Idaho fescue	none to slight	none to slight	none to slight
Ledyard McGuiness #20416	Silty 15-19" PZ	Idaho fescue/bluebunch wheatgrass	slight to moderate	slight to moderate	slight to moderate
Matltby's Mound East #30402	Sandy 10-14" PZ	Idaho fescue/bluebunch wheatgrass	slight to moderate	slight to moderate	slight to moderate
Matlby's Mound West #30402	Silty 15-19"PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
McAtee Bridge #10529	Shallow to Gravel 10-14" PZ	Idaho fescue/bluebunch wheatgrass	slight to moderate	**moderate**	**moderate to extreme**
Mill Creek-Gustin #10465	Shallow to Gravel 10-14" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
North Indian Creek #10140	Silty 10-14" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
North Meadow Creek #10380	Shallow to Gravel 15-19" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight

Allotment Name & Number	Ecological Site Name	Plant Association	Degree of Departure from Expected		
			Soil Site Stability	Hydrologic Function	Biotic Integrity
North Morgan #20423	Shallow to Gravel 10-14" PZ	Idaho fescue/bluebunch wheatgrass	slight to moderate	slight to moderate	**moderate**
Pony Gulch Isolated # 20405	Shallow to Gravel 15-19" PZ	Sagebrush/Idaho fescue	none to slight	none to slight	none to slight
Red Bluff #00982	Shallow 15-19" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	none to slight
Revenue Commons #20407	Shallow to Gravel 15-19" PZ	Sagebrush/Idaho fescue	slight to moderate	slight to moderate	slight to moderate
Strawberry Ridge #10421	Silty 15-19" PZ	Sagebrush/Idaho fescue	none to slight	none to slight	none to slight
Wall Creek AMP #10522	Shallow to Gravel 15-19" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	slight to moderate
Wall Cr. Game Range #00819	Shallow to Gravel 10-14" PZ	Idaho fescue/bluebunch wheatgrass	none to slight	none to slight	**moderate**
West Fork un-allotted	Shallow to Gravel 15-19" PZ	Sagebrush/Idaho fescue	none to slight	none to slight	none to slight

The MW was evaluated for weed infestations using treatment records and inventories from the Dillon Field Office, the Madison County Weed Coordinator and our collective inventories and observations during the field assessments. A comprehensive discussion of noxious weeds in the MW is in the Biodiversity section below.

Findings and Analysis

Based on the evaluation methodology and process, comparative analysis of quantitative data collected at long term trend study sites, and extensive field observations and discussions by the IDT, the uplands in 33 of 39 grazing allotments, approximately 90% of the total allotted BLM land acres, are PFC or FAR with an upward trend. Also, all the uplands in the un-allotted and un-leased tracts, approximately 7,089 acres (including 4,473 acres in the Bear Trap Wilderness), are in PFC. The uplands in six grazing allotments were rated FAR with a static or downward trend. These allotments are McAtee Bridge, North Morgan, Bar Seven, Sitz, Shirley and Michel.

McAtee Bridge allotment; August 2009

The upland health evaluation in the **McAtee Bridge** allotment indicates that the uplands are in FAR condition with a downward trend. The BLM administered public land in the allotment (450 out of 4,500 acres) is located on low river bottom terraces in several parcels adjacent the Madison River. Even at full potential this shallow to gravel ecological site has limited biomass production potential: between 1,300 pounds per acre in above normal precipitation years and 700 pounds

per acre during below normal years. The estimated production in the south pasture for 2009, an above average year, is 400 pounds per acre. The upland health evaluation showed a moderate departure from expected hydrological function and moderate-to-extreme departure from biotic integrity. Ecological functions have been severely compromised by the extreme shift from cool season grasses, primarily bluebunch wheatgrass, Indian ricegrass and needle-and-thread to the warm season, less productive blue grama grass and club moss. The amount of bare ground is elevated, soil surface resistance to erosion is reduced and water infiltration is less efficient. Also, heavy infestations of knapweed are present on very rocky bars near the Madison River in the south pasture. The shift in dominant plant community indicates repeated spring utilization by livestock. Bluebunch wheatgrass is susceptible to annual early season use and ideally should be grazed moderately only one in three years during the spring.

The uplands health evaluation in the **North Morgan** and **Bar Seven** allotments indicates that the uplands are in FAR condition with a static trend due to a moderate departure from the expected dominate functional structural plant community and invasive species (cheatgrass). Current livestock management is partially responsible for perpetuating the situation.

Plant biomass production on the river terrace pasture of the **Bar Seven** allotment is estimated to be 40 to 60% of potential (650-750 pounds per acre) due to the dominance of blue grama and concurrent decrease of cool season grasses like bluebunch wheatgrass and needle and thread. Consequently, litter in the openings between plants is reduced, water flow patterns are larger than expected and water and wind erosion have resulted in pedestals and terracettes exposing plant roots and basal areas. Approximately 27% of the total acres in the allotment are administered by BLM (1,575 of 5,760 acres).

Bar Seven allotment; September 2009

BLM administered land in the **North Morgan** allotment is located next to the Madison River on rocky, shallow soil which has limited production potential. The relative amount of blue grama on BLM administered land has reduced plant community production and consistent spring use has reduced reproductive capacity and vigor of forage species. Scattered patches of cheatgrass are also common. The proliferation of large cobbles and river rock throughout the pasture not only limits site potential but reduces the amount of bare ground and protects the site from potential wind and/or water erosion. Only about 160 acres of this 2,100 acre allotment are administered by the BLM (8%).

Sitz allotment; July 2009

A small percentage of the uplands in the **Sitz** allotment are non-functional (NF) for various reasons. The BLM administered portion of the allotment consists of a few scattered un-patented mining claims (150 acres) that are fenced in with thousands of acres of private land. Ownership boundary lines are not clearly delineated on this Custodial allotment and grazing use on the BLM administered land is authorized to be in conjunction with the lessee's normal livestock operation.

The primary problem is the placement of cattle management structures on BLM administered land. A corral, working pens, a squeeze chute, concrete feeding barriers, and two small sheds have been built on BLM administered land. These man-made facilities have eliminated the native vegetation community, diminished the soil's infiltration capability, exposed acres of bare ground, increased wind and water erosion and generally reduced biodiversity.

The upland plant community and biodiversity have also been altered by a crested wheatgrass seeding in the vicinity of the livestock working facilities, and thriving infestations of cheatgrass in the area.

The uplands in the **Shirley** allotment are FAR with a static trend and threatened by the loss of native grasses due to weed and cheatgrass infestations. In 2008 a fire burned about 30 acres in the upper pasture and subsequently aggressive populations of leafy spurge, knapweed and cheatgrass have moved into the disturbed area. There are also very large and vigorous populations of knapweed and houndstongue along stream reach 2051 on the southwest slope of the upper pasture. In spite of years of expensive weed treatments, noxious weeds have continued to spread across both private and BLM administered land in the area. Large patches of cheatgrass are also well established on the BLM administered portions of the allotment. Current livestock management is not a factor in the proliferation of weeds or invasive species but historic use by livestock and wildlife may have contributed to their establishment and subsequent proliferation.

The **Michel** allotment has widespread knapweed infestation associated with the abandoned McCoombs Mine. The loss of native functional structural plant communities to knapweed is impacting upland health and biodiversity. About 20 acres of this 54 acre allotment are inundated with knapweed scattered among rusting mining implements and discarded machinery. However, the BLM obtained funds for Abandoned Mine Lands and cleaned up and removed the debris associated with the old mining activity during the fall of 2009.

Recommendations for Upland Health

1. North Morgan and Bar Seven allotments: Revise the terms and condition for livestock grazing. Analyze changes to season of use, length of season, numbers of allocated AUM's and/or numbers of authorized cattle, incorporation of rest and/or deferment, and range projects.
2. McAtee Bridge allotment: Revise grazing management by considering changes to season of use, reducing numbers of authorized livestock, incorporating rest or deferring use in the north and south pastures, constructing fences and/or developing livestock watering facilities.
3. Sitz allotment: Consider removing all semi-permanent cattle management structures and rehabilitate the associated disturbed area **or** consider disposal of this 150 acres.
4. Shirley allotment: Consider the lessee's request to change the period of authorized use to late fall and winter and the kind of livestock to domestic horses.
5. Michel allotment: Aggressively treat weeds in old mining area. Use temporary 3-wire high tensile electric fence to isolate weed infested portion of the allotment. Consider reducing the number of authorized AUM's in the allotment to more accurately reflect its altered potential and carrying capacity.
6. Wall Creek Game Range: Treat large cheatgrass infestations on BLM administered land adjacent the Madison River.

Riparian and Wetland Areas

Western Montana Standard #2: *"Riparian and wetland areas are in proper functioning condition"*

Affected Environment

The rivers and streams in MW assessment area drain nearly one million acres of BLM, Forest Service, State and private land (**Maps 3-8)**. The Madison River is the dominant hydrologic feature. It flows into the MW just below Quake Lake, runs north into Ennis Lake, through the Bear Trap canyon and out of watershed at Black's Ford. Numerous springs and small mountain tributaries flow out of the high country, merging into dozens of larger stream systems which eventually empty into the Madison River.

There are also many acres of lentic (standing water) wetland habitats within the MW. The most extensive wetlands in the watershed are located in the Axolotl Lakes area. Riparian and wetland communities around springs, seeps and pothole ponds are important contributors to habitat diversity as well as valuable water sources.

Riparian/Wetland Habitat Types

Riparian and wetland habitat types within the MW are classified according to landscape position and the influence of water. The U.S. Fish and Wildlife Service (USFWS) developed a comprehensive classification system for wetlands and deepwater habitats (Cowardin et al., 1979) which is used by most federal and state agencies charged with managing these resources. The system defines wetlands by plants (hydrophytes), soils (hydric soils), and frequency of flooding.

Two Cowardin wetland systems, Riverine and Palustrine, are frequently found on BLM administered lands within the watershed. In general terms, the Riverine System includes all wetlands and deepwater habitats contained within a channel that have less than 30% vegetative cover. The Madison River is an example of a Riverine System, as are smaller streams with little or no vegetative cover. Since the majority of the riparian and wetland areas within the MW have greater than 30% vegetative cover, they fall into the Palustrine System.

Three classes of the Palustrine System are found in the watershed: Emergent Wetlands, dominated by emergent herbaceous vegetation; Scrub-Shrub Wetlands, dominated by shrubs or small trees; and Forested Wetlands, dominated by trees over 20 feet tall. The Beaked Sedge habitat type is an example of an Emergent wetland. The Engelmann Spruce/Red-osier dogwood habitat type is an example of a Forested wetland and the Geyer Willow/Beaked Sedge habitat type is an example of a Scrub Shrub wetland.

Soils

Hydric soils are a small component of the landscape, but play an important role in ecological processes. Hydric soils have prolonged exposure to water and are poorly drained. They are commonly found in depressions, swales, floodplains, springs, wet meadows and marshes.

Hydric soils are a minor component throughout the watershed, except in the vicinity of Axolotl Lakes and along the Madison River. Several hydric soil types are found in the Axolotl area including Cryoborolls in depressions and the Libeg-Adel, Worock-Mikesell, and Woodall-Blaine-Hapgood soil complexes mostly in swales. Hydric soils are associated with floodplains and abandoned channels along the Madison River in the upper sections of the watershed from the unallotted parcel near Trout Creek and continuing downriver to the Mill Creek-Gustin allotment. The Maxville-Bearmouth and Rivra-Ryell-Havre soil complexes are found along the Madison River floodplains.

Madison River

The BLM has management responsibility on lands adjacent to at least one and often both banks along 21 miles of the Madison River. Because of the presence of dams, state and federal agencies divide the Madison into upper, middle and lower sections. The entire middle section, and the lower section that flows through Madison County, are within the MW.

Water flows in the Madison are regulated by two dams, as well as Quake Lake. Pennsylvania Power and Light (PPL) Montana operates one hydroelectric project, Madison Dam, and one reservoir, Hebgen Lake on the river. Madison Dam has been operating since 1906 and Hebgen Reservoir was completed in 1918. With the upper Madison as its main feeder, Hebgen Lake is used for water storage and to regulate flow to the eight hydroelectric plants in the Madison-Missouri river system. Due to flow regulation, much of the floodplain is disconnected from its channel, its water table has dropped and support of riparian or wetland vegetation is reduced

The Madison River from Indian Creek to Ennis Lake exhibits classic Rosgen Valley Type VIII characteristics. It flows through a wide valley with a well developed floodplain and abandoned terraces. Using the Rosgen system, the entire Madison River channel is classified C3, which means that it has a high width to depth ratio and a gentle gradient.

The Madison River is subject to ice gorging which causes flooding by raising the water level. Ice gorging typically occurs during the coldest part of the winter where streams are too turbulent to form crystalline ice. Instead, frazil ice, a slushy ice composed of loose ice crystals, and anchor ice, form. The gorging scours the vegetation along the banks, moves soil and rocks, and changes the character of the stream banks along these areas. Hebgen Reservoir has mitigated ice gorging which originates in two locations, one of which, the Madison Dam, is located in the MW assessment area (Stevens, 1921).

Streams

There are approximately 40 stream miles (excluding the Madison River, which is listed separately above) flowing through BLM administered land within the assessment area. As surface water and/or groundwater they eventually run into the Madison River, with the exception of Butcher Gulch and Bachelor Gulch which flow into the Ruby River. In the Northwest, the primary streams are Antelope, Cataract, Charcoal, Pony and Willow Creeks. Canadian, Hot Springs, Lower Revenue, Preacher, Rattlesnake and Willow Creeks are found in the North Central area. Barn, Bear Trap, Fall, Spring and Warm Springs are in the North East area. Near Ennis Lake the Creeks are Jourdain, Bradley and Trail. The Creeks in the Axolotl area are Arasta Creek, Bachelor Gulch, Buffalo, Butcher Gulch, Haypress, Moran, and Wigwam as well as tributaries to Blue and Twin Lakes. Creeks in the vicinity of the Wall Creek Game Range and the upper end of the watershed include Corral, Hyde and Ruby Creeks as well as Butte, Horse, Papoose, Quaking Aspen and Standard Creeks.

Springs

Spring information is limited throughout the MW. No comprehensive database of springs was available for this assessment. The National Wetland Inventory (NWI) is nearing completion for the State of Montana and will be a valuable resource in the future. The Montana/Dakotas BLM, in recognition of the need for a comprehensive wetland inventory, is working with and providing funding to Montana Natural Heritage Program to update and ground truth NWI information. Absent this information, the IDT assessed known wetland areas, as well as inventoried areas likely to incorporate wetland resources.

Several springs that were developed to provide water for livestock were inventoried and assessed: Axolotl Lakes Spring, in the Axolotl Lakes allotment, Lower Revenue Spring in the Revenue Common allotment, Montana 32 Spring in the Shirley allotment, Trail Creek Spring in the Trail Creek C&H AMP, and Wallace Spring in the Wallace Peak allotment.

Wetlands

Numerous isolated wetlands exist within the assessment area. As with springs, the BLM has no comprehensive inventory, but the forthcoming NWI will assist resource efforts in the future. However, in the Axolotl Lakes Area, wetland information is more comprehensive. Wetlands and lakes ranging in size from less than ¼ acre to close to 15 acres, totaling over 46 acres, were visited, photographed, assessed and added to the database in the course of this assessment.

Shoreline

The BLM manages two recreational sites with about three quarters of a mile of shoreline on Ennis Lake at Kobayashi Beach and Clute's Landing.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard

BLM policy specifies using several complimentary monitoring and evaluation methodologies to determine conformance with the Riparian Health Standard. The IDT used the Lotic and Lentic Riparian Area Management Assessment Methodologies (TR 1737 15 and 16), also known as PFC Assessment Methodologies, to evaluate riparian systems and wet meadows. A Guide to Managing, Restoring, and Conserving Springs in the Western United States (TR 1737-17) was used for springs. These technical references are available to read, or download, on the BLM Library webpage, http://web.nc.blm.gov/blmlibrary.

The PFC lotic assessment evaluates stream geometry, channel morphology and stability, hydrological function, riparian vegetative condition, as well as soil erosion and deposition. Applicable portions of the lentic methodology were used to assess springs and wet meadows. During the summer and fall of 2009, the IDT assessed 59 stream reaches, flowing through approximately 41 miles of BLM administered land, visited most of the springs and wetlands within the watershed, and completed PFC evaluations on each.

Evaluation of resource conditions on the Madison River was complicated by the nature of BLM management. The river forms allotment boundaries and management is often different on the right and the left banks. The right bank and the left bank on the same stretch of river were evaluated concurrently. Given the channel width, flow and bed materials, the role played by riparian vegetation is much different than on tributary streams more typically seen on BLM administered lands managed by the Dillon Field Office. Recognizing the many aspects of the river that are beyond the control of the authorized officer, the river was evaluated based upon altered potential.

Many of the riparian areas in the assessment area were originally described, and mapped, based on aerial photos and U.S. Geological Survey (USGS) topographical maps. This information was the basis for GIS mapping. In recent years springs and wetlands have been added to the GIS inventory and mapping effort. Subsequent ground-truthing has verified that a number of drainages previously mapped as riparian habitat are actually dry washes which lack riparian characteristics. These reaches have been removed from the stream/wetland inventory. Conversely, several stream reaches, springs and wetlands not previously identified, were assessed and added to the BLM riparian-wetland data base during the assessment process.

Data was collected on all the streams in the MW using the Montana Riparian Wetland Assessment (MRWA) during the 2008 and 2009 field seasons prior to the IDT's PFC assessments. The MRWA inventories and measures physical and vegetative characteristics, streambed materials, and measures channel dimensions (bank full width, mean bank full depth, flood prone width). Physical measurements are utilized to assess channel morphology and stability and tentatively classify streams at Rosgen Level II. The MRWA also observes and records the composition, cover, vigor and the amount of recruitment and regeneration of all vegetative species within the riparian zone. The data gathered was used by the IDT in conjunction with the PFC assessment process to ascertain riparian health and trends on a reach by reach basis.

Six Riparian Coverboards were established on a number of stream reaches in the assessment area, dating back to the 1980's. The Riparian Coverboard system measures changes in woody species cover. These studies were re-read prior to the IDT's assessment to evaluate changes in woody riparian vegetative cover on Cataract and Pony Creeks in the Strawberry Ridge allotment, Arasta and Buffalo Creeks, as well as tributaries to Blue and Reservoir Lakes in the Axolotl area. This data, along with the photographic record associated with Coverboard studies was used by the IDT to help determine vegetative trend.

Summaries of data collected using MRWA and Cover Board monitoring methodologies are included in the MW project file and available for review at the Dillon Field Office.

The Axolotl Lakes Spring, Lower Revenue Spring, Montana 32 Spring, Trail Creek Spring and Wallace Spring were inventoried and assessed to determine whether hydrology, hydric soils and hydric vegetation are being maintained.

Findings and Analysis

There are riparian resources in 29 of 39 allotments. Based on the evaluation methodology and process, analysis of quantitative data and extensive field observations and discussions, the riparian and wetland resources in 22 of the allotments are PFC or FAR with an upward trend. The riparian resources in all the un-allotted and un-leased tracts which includes the Bear Trap Wilderness are also either PFC or FAR with an upward trend.

In seven allotments the majority of riparian and or wetland resources were not PFC or, while FAR, did not have an upward trend. They are Aspen Creek, Elmer, Michel, Preacher Creek, Revenue Common AMP, Wallace Peak and Windy Pass AMP.

Madison River

The IDT documented resource concerns associated with riparian conditions along the river in the McAtee Bridge and Bar Seven allotments. Livestock use resulted in a change in composition of riparian vegetation and subsequent erosion of a short segment of streambank. The large, heavy boulders carried in by historic and ongoing ice gorging provide some mitigation and reduction in over-widening. However, the concerns noted were not affecting the functionality of the Madison River. The IDT found all reaches along the Madison River in PFC.

Streams

Of the 72 stream reaches assessed, 50 reaches, totaling 26.9 miles, were rated PFC. Five reaches, totaling 2.2 miles, were rated FAR with an upward trend. Twelve reaches, totaling 6.9 miles, were rated FAR with a static or no apparent trend. Four reaches, totaling 2.5 miles, were rated FAR with a downward trend. One reach, totaling 0.4 miles, was rated NF.

The percentage of the total stream miles in each functional class is illustrated in the figure 1.

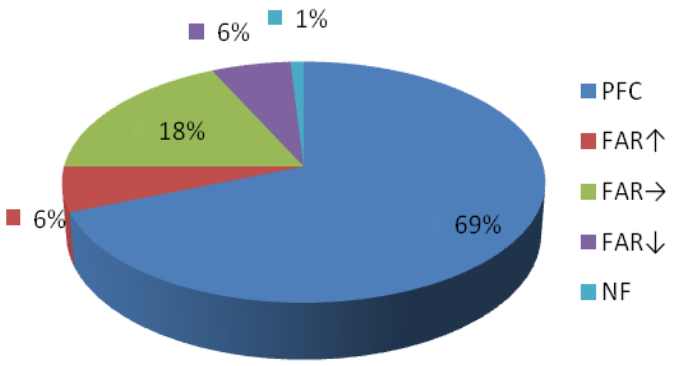


Figure 1: Percentage of Stream Miles Assessed by Functionality Calls

Where streams were not PFC, concerns included: alteration of stream morphology, reduced access to floodplains, down cutting, reduction in species diversity and composition, reduced vegetative cover, limited species recruitment and regeneration, reduced structural diversity, and decreased vigor of streamside vegetation. Increasing juniper cover is adversely affecting deciduous riparian habitat on Spring Creek in the Trail Creek C&H allotment and Trail Creek in the Jourdain Creek allotment in the MW assessment area.

Stream morphology (channel shape and dimensions, including width and depth, and gradient) and bed materials provide important information to determine a stream's function. Stream power is reduced as a channel becomes wider. With a reduction in power, the ability of a stream to maintain riffles and pools, and its ability to move and sort channel materials, is diminished. Sediments accumulate, forcing the stream to widen even more. The BLM strives to promote conditions that enhance a streams ability to maintain stable dimensions, patterns and profiles.

Table 4 summarizes the functional status of all the surveyed stream reaches in the MW.

Table 4: Functional Status of Stream Reaches

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Antelope Creek	Windy Pass	664	Engelmann spruce/Red-osier dogwood	FAR→	0.5
Trib to Antelope Creek	Windy Pass	665	Engelmann spruce/Red-osier dogwood	FAR→	0.5
Trib to Antelope Creek	Windy Pass	666	Engelmann spruce/Red-osier dogwood	FAR→	0.8
Trib to Antelope Creek	Strawberry Ridge	2046	Engelmann spruce/Red-osier dogwood	FAR→	0.5
Trib to Cataract Creek	Strawberry Ridge	613	Beaked sedge	PFC	0.7
Cataract Creek	Strawberry Ridge	614	Engelmann spruce/Red-osier dogwood	PFC	1.2

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Charcoal Creek	Strawberry Ridge	615	Engelmann spruce/field horsetail	PFC	0.6
Charcoal Creek	Strawberry Ridge	616	Engelmann spruce/field horsetail	PFC	0.4
Charcoal Creek	Strawberry Ridge	617	Engelmann spruce/Red-osier dogwood	PFC	0.3
Trib to Charcoal Creek	Strawberry Ridge	618	Engelmann spruce/Red-osier dogwood	PFC	0.2
Charcoal Creek	Strawberry Ridge	619	Engelmann spruce/Red-osier dogwood	PFC	0.5
Pony Creek	Strawberry Ridge	653	Engelmann spruce/Red-osier dogwood	FAR↑	0.9
South Fork Pony Creek	Strawberry Ridge	654	Engelmann spruce/Red-osier dogwood	PFC	0.4
South Fork Pony Creek	Strawberry Ridge	655	Engelmann spruce/Red-osier dogwood	PFC	0.4
North Fork Willow Creek	Glen Kyle	660	Engelmann spruce/Red-osier dogwood	PFC	0.6
South Fork Willow Creek	Willow Creek	661	Engelmann spruce/Red-osier dogwood	PFC	0.6
Trib to South Fork Willow Creek	Willow Creek	667	Subalpine fir/bluejoint reedgrass	PFC	0.5
Canadian Creek	Wallace Peak AMP	610	Engelmann spruce/Red-osier dogwood	FAR→	1.1
Trib to Canadian Creek	Preacher Creek	611	Quaking aspen/Red-osier dogwood	FAR→	0.4
Middle Fork Hot Springs Creek	Wallace Peak AMP	623	Douglas-fir/Red-osier dogwood	FAR→	0.5
North Fork Hot Springs Creek	Wallace Peak AMP	624	Engelmann spruce/Red-osier dogwood	PFC	0.6
North Fork Hot Springs Creek	Wallace Peak AMP	625	Douglas-fir/Red-osier dogwood	FAR↓	1.0
North Fork Hot Springs Creek	Wallace Peak AMP	668	Douglas-fir/Red-osier dogwood	PFC	0.8
North Fork Hot Springs Creek	Wallace Peak AMP	670	Douglas-fir/Red-osier dogwood	FAR→	0.9
North Fork Hot Springs Creek	Pony Gulch Isolated	2041	Subalpine fir/bluejoint reedgrass	PFC	0.3
South Fork Hot Springs Creek	Revenue Common	626	Engelmann spruce/Red-osier dogwood	FAR→	0.8
South Fork Hot Springs Creek	Revenue Common	671	Douglas-fir/Red-osier dogwood	FAR	0.6
Lower Revenue Spring	Revenue Common	2043	Douglas-fir/Red-osier dogwood	FAR→	0.1
Preacher Creek	Preacher Creek	658	Engelmann spruce/Red-osier dogwood	FAR↓	0.8
South Fork Preacher Creek	Preacher Creek	657	Engelmann spruce/Red-osier dogwood	PFC	0.8
Rattlesnake Creek	Preacher Creek	659	Engelmann spruce/Red-osier dogwood	PFC	0.7
Willow Creek	Unallotted	663	Geyer willow/beaked sedge	PFC	0.6

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Trib to Hot Springs Creek	Elmer	2036	Douglas-fir/Red-osier dogwood	NF	0.4
Trib to Madison	Red Bluff	2044	Quaking aspen/Red-osier dogwood	FAR↑	0.5
Trib to Madison	Unallotted	2045	Douglas-fir/Red-osier dogwood	PFC	0.7
Barn Creek	Trail Creek C&H	603	Douglas-fir/Red-osier dogwood	PFC	1.0
Fall Creek	Trail Creek C&H	605	Douglas-fir/Red-osier dogwood	PFC	0.7
Upper Fall Creek	Trail Creek C&H	2048	Engelmann spruce/Red-osier dogwood	PFC	1.8
Spring Creek	Trail Creek C&H	604	Douglas-fir/Red-osier dogwood	FAR↓	0.5
Bear Trap Creek	Unallotted	679	Quaking aspen/Red-osier dogwood	PFC	0.3
Warm Springs Creek	Uallotted	2047	Douglas-fir/Red-osier dogwood	PFC	0.3
Moose Skull Spring	Trail Creek C&H	2042	Engelmann spruce/Red-osier dogwood	PFC	0.4
Trail Creek	Jordain	606	Douglas-fir/Red-osier dogwood	PFC	0.4
Bradley Creek	Michel	607	Quaking aspen/Red-osier dogwood	FAR→	0.3
Bradley Creek	Easter	672	Quaking aspen/Red-osier dogwood	PFC	0.3
Arasta Creek	Unallotted	609	Subalpine fir/bluejoint reedgrass	FAR↑	0.4
Bachelor Gulch	Unallotted	889	Subalpine fir/bluejoint reedgrass	PFC	1.8
Blue Lake trib	Unallotted	2024	Subalpine fir/bluejoint reedgrass	PFC	0.2
Buffalo Creek	Unallotted	608	Subalpine fir/bluejoint reedgrass	PFC	1.7
Trib to Buffalo Creek	Unallotted	2001	Beaked sedge	PFC	0.3
Butcher Gulch	Axolotl Lakes	602	Engelmann spruce/Red-osier dogwood	FAR↑	0.2
Haypress Creek	Unallotted	2002	Douglas-fir/Red-osier dogwood	PFC	0.9
Haypress Creek	Unallotted	2027	Beaked sedge	PFC	0.4
Trib to Moran Creek	Unallotted	694	Engelmann spruce/Red-osier dogwood	PFC	0.3
Trib to Moran Creek	Unallotted	2111	Engelmann spruce/Red-osier dogwood	PFC	0.6
Trib to Moran Creek	Unallotted	2119	Subalpine fir/bluejoint reedgrass	PFC	0.4
Reservoir lake trib	Unallotted	601	Subalpine fir/bluejoint reedgrass	PFC	0.3
Twin Lake trib	Unallotted	692	Engelmann spruce/Red-osier dogwood	PFC	0.1
Twin Lake trib	Unallotted	693	Engelmann spruce/Red-osier dogwood	PFC	0.1
Twin Lake trib	Unallotted	2012	Subalpine fir/bluejoint reedgrass	PFC	0.3
Trib to Wigwam Creek	Unallotted	2003	Douglas-fir/Red-osier dogwood	PFC	0.6
Wigwam Creek	Unallotted	2004	Engelmann spruce/Red-osier dogwood	PFC	0.1
North Fork Corral Creek	Corral Creek	620	Engelmann spruce/Red-osier dogwood	PFC	0.2
Middle Fork Corral Creek	Corral Creek	621	Engelmann spruce/Red-osier dogwood	PFC	0.5
West Fork Corral Creek	Corral Creek	622	Subalpine fir/bluejoint reedgrass	PFC	0.3

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Hyde Creek	Wall Creek Game Range	2040	Cottonwood/Red-osier dogwood	PFC	0.3
Ruby Creek	Unallotted?	2037	Cottonwood/Red-osier dogwood	FAR↑	0.2
Butte Creek	Trout Creek	2025	Engelmann spruce/Red-osier dogwood	PFC	0.3
Horse Creek	Aspen Creek	2015	Engelmann spruce/Red-osier dogwood	PFC	0.3
Papoose Creek	Papoose Creek	652	Engelmann spruce/Red-osier dogwood	PFC	0.3
Quaking Aspen	Aspen Creek	2035	Douglas-fir/Red-osier dogwood	FAR↓	0.2
Quaking Aspen	Aspen Creek	600	Douglas-fir/Red-osier dogwood	FAR→	0.5
Standard	Unallotted	2014	Engelmann spruce/Red-osier dogwood	PFC	0.5

*↑=upward, →=static, ↓=downward

Allotment-specific riparian health concerns are discussed below. Allotments in which riparian and wetland resources rated as PFC or FAR with and upward trend are not discussed in this section, but information on these resources is available upon request. Additional stream reach specific data for any of the riparian/wetland areas in the MW is available at the Dillon Field Office.

Aspen Creek

Three reaches flow through the Aspen Creek allotment: Aspen Creek, North Fork of Aspen Creek and Horse Creek. Aspen Creek, reach 600, was rated FAR with a static trend by the IDT. Concerns included over-widening, a reduction in ability to transport its sediment, bank shearing, and a reduction in sedge. The North Fork of Aspen Creek, reach 2035 was rated FAR with a downward trend. Concerns included an over-widened channel and a reduction in the stream's ability to move its sediment as evidenced by braiding and aggradation. Trailing, excessive browsing of willows, lack of willow regeneration, and a reduction in sedge and aspen were also observed. Horse Creek (#2115) was rated PFC.

Elmer

A tributary to Hot Springs Creek, reach 2036, flows through the Elmer allotment and was rated NF by the IDT. Concerns included alteration of habitat by historic mining, channel over-widening, debris (materials and machinery) in the stream, undersized culverts on two road crossings, non-native vegetation (planted golden willows), and invasive weeds (leafy spurge and houndstongue). Ponds along the reach are also impacting the stream by raising stream temperatures.

Michel

Bradley Creek, reach 607, flows through the Michel allotment, and has been impacted by historic mining. Mining waste drawn from an adit in the hillside adjacent to the stream was spread out in the riparian area and served as base material for an old railway next to the stream. A road built adjacent to Bradley Creek is a likely source of sediment that was observed in the stream. A variety of material, including bedsprings and a toilet, has been dumped into the stream channel over the years, possibly to control bank erosion. An upstream culvert may be impacting the

stream. A pump and a bridge were observed which may not be authorized. The IDT rated this reach FAR with a static trend and noted that some conditions are out of the control of the authorized officer.

Preacher Creek
Canadian, Preacher, and Rattlesnake Creeks flow through the Preacher Creek allotment. Rattlesnake Creek was rated PFC. Canadian Creek, reach 611, was rated FAR static, with concerns including channel over-widening, trampling, and excessive browse of willow with a negative impact on regeneration. In some areas the channel has been heavily impacted by livestock trailing, however the stream has a viable sedge community and the potential to rebuild its channel. Preacher Creek, reach 658, rated FAR with a downward trend. Concerns included extensive bank trampling, the replacement of the deep rooted bank stabilizing sedge community by Kentucky bluegrass, over-widened channel characteristics and a reduction in woody species, particularly willows. The local soils are granitic which are highly erodible. Reach 657, the South Fork of Preacher Creek, drains steep terrain, has an A channel, and was determined to be PFC.

Revenue Common AMP
Two reaches of the South Fork of Hot Springs Creek, 626 and 671 were rated FAR with a static trend by the IDT. Concerns on reach 671 include bank trampling, over-widening, a four wheeler track along portions of the reach, no middle age class of willows, and greenline composition of mostly the shallow rooted species brook grass, timothy and Kentucky bluegrass. Concerns on reach 626 are similar, but also included the loss of Bebb willows due to Douglas-fir encroachment and shading. Houndstongue and Canada thistle were noted along these reaches. Over-widening and the ATV trail have resulted in aggradation as the stream's capacity to maintain its geometry or process its sediment has been reduced. However, good aspen regeneration was observed in openings along the reach. The Lower Revenue Spring is fed by a short spring brook (reach #2043), and was rated FAR with a static trend by the IDT because of livestock trailing, bank disturbances, and sedimentation. Canada thistle and houndstongue were also noted in and adjacent to the riparian area.

Wallace Peak AMP
Canadian Creek (reach #610) is a high mountain stream with an A channel flowing through an Englemann spruce red-osier dogwood habitat type. Streams in this habitat are sensitive to bank disturbances because they lack a deep rooted herbaceous understory. Canadian Creek was determined to be FAR with a static trend. Resource concerns are trailing and bank shearing and over-widening of the stream channel resulting in a reduction in sediment transport efficiency and altered channel geometry. Three streams, reaches 625, 670 and 623, were determined to be in FAR condition with a static trend. IDT concerns focused on livestock trailing, which has resulted in some bank shearing and channel over-widening. Reach 668, a tributary to the North Fork of Hot Springs Creek, was rated PFC, but the IDT noted some impacts from trailing and localized channel over-widening. Stream reach 624 was determined to be PFC.

Windy Pass AMP
The Windy Pass allotment has three riparian reaches: the main stem of Antelope Creek and two tributaries. These are all very steep A channels. The soils are derived from granite and are

highly erodible especially on the drier south facing slopes. There are numerous springs and seeps which feed these streams. The habitat type is Engelmann spruce/Red-osier dogwood which is susceptible to the disturbances from livestock trailing. The IDT noted livestock trails, pugging, and hummocking in the riparian area of reach 664. Bluegrass meadows lacking deep roots were also observed. The channel was over-widened and aggrading. The capacity for the stream to move its sediment and maintain channel geometry is reduced. The reach was rated FAR static. Reaches 665 and 666 had similar findings and also were rated FAR static. In reach 665 and the lower portion of reach 666 the impact to seeps and wet meadows by livestock hoof action was noted.

Jourdain Creek
Trail Creek (reach #606.) was determined to be in PFC. However, increasing juniper cover is adversely affecting deciduous riparian habitat and the conversion is reducing the stability of the stream banks and the herbaceous species understory.

Strawberry Ridge
All stream reaches in the Strawberry Ridge Allotment were rated as PFC or FAR with the upward trend with one exception. The lower portion of Antelope Creek, which flows from the Windy Pass Allotment into the Strawberry Ridge allotment, rated as FAR static. Livestock trailing is impacting this short reach, resulting in the channel becoming over-widened, reducing the ability of the channel to maintain its morphology and move sediment. This is a spruce habitat site which typically has less deep binding root masses than sedge or willow types and is more sensitive to disturbance.

Trail Creek AMP
All stream reaches in the Trail Creek AMP Allotment were rated as PFC or FAR with and upward trend with one exception. Spring Creek was rated as FAR with a downward trend. Increasing juniper cover is adversely affecting deciduous riparian habitat on Spring Creek. Livestock trailing is impacting a short portion of this reach, the channel is becoming over-widened and its capacity to move sediment and maintain its channel is reduced. Some channel braiding was observed which indicated the channel is aggrading.

Developed Springs
BLM visited the five springs that, according to the BLM's Project Inventory, were developed to serve allotments in the MW.

The Axolotl Lakes Spring in the Axolotl Lakes allotment had an undersized exclosure which was in need of repair. No stock tank was found and trampling and hummocking was noted outside the spring exclosure.

At the Lower Revenue Spring in the Revenue Common allotment, trampling and hummocking are occurring. The spring is located in a narrow canyon which funnels livestock movement and adds pressure to the resource and the trough is in a very poor location in a steep, narrow canyon. The trough was installed in the early 1980s, had no bird ramp, and has deteriorated over the years. There is no spring exclosure associated with this development. Flow was less than .1 gallon per minute (gpm).

The Montana 32 Spring is located in the Shirley allotment. There is an exclosure that is in fair condition, but is undersized. This spring flows at 2gpm. Below the spring is a small stock pond. There was evidence of recent wildlife and horse use at the pond. A very dense infestation of spotted knapweed was found adjacent to and below the pond.

The Trail Creek Spring in the Trail Creek C&H AMP was identified for development in the early 1980s, but no evidence was found that the spring was ever developed. Documented concerns include juniper encroachment, and trampling and hummocking at the spring source.

At the Wallace Spring in the Wallace Peak allotment, the stock tank and headbox were dry, and there was no bird ramp. The habitat at this spring included aspen and willow. The aspen are receiving heavy browse and there is diminished regeneration.

In addition to the spring developments recorded in the Range Improvement Project Inventory, two developed and one undeveloped spring were identified. The undeveloped spring was in the Axolotl Lakes allotment, and was being impacted by livestock use. The developed springs were located in the Bar 7 allotment (T7S, R1W, S31, NE, SW) and in the vicinity of the Easter allotment (T4S, R1E, S18, SE, SE). The developed spring near the vicinity of the Easter allotment may be on BLM administered land. The spring development in the Bar 7 allotment is on BLM administered land but has not been authorized. This may be due to the intermixed land ownership in this area.

Wetlands

Numerous isolated wetlands exist within the assessment area, ranging in size from less than ¼ acre to close to 15 acres. Table 5 summarizes the functional status and acres of the surveyed lentic systems (ponds, lakes, wetland areas) within the MW.

Table 5: Functional Status of Wetlands and Ponds

Resource Name	Allotment	BLM Reach ID	Functional Rating & Trend	Acres
Axolotl Lake	Unallotted	696	PFC	14.9
Axolotl Pond 2	Unallotted	688	PFC	2.7
Axolotl Pond 3	Unallotted	2031	PFC	0.5
Blue Lake	Unallotted	695	PFC	5.7
Grassy Lake	Unallotted	1268	PFC	9.7
Grassy Lake Pond 3	Unallotted	691	PFC	0.19
Lower Twin Lake	Unallotted	687	PFC	3.8
Reservoir Lake	Unallotted	686	PFC	9.0
Ennis Lake	Unallotted	2038	N/A	*
Ennis Lake	Unallotted	2039	N/A	*
Ennis Lake Pond	Jourdain Creek	685	PFC	23.8
River Bend Wetland	Wall Creek AMP	2051	PFC	19.5

Recommendations for Riparian Health

1. Consider changes in timing, duration and/or intensity of use as well as number of livestock. Incorporation of rest into a grazing system and structural projects should also be considered on the following allotments: Aspen Creek, Preacher Creek AMP, Elmer, Revenue Commons AMP, Wallace Peak AMP and Windy Pass AMP.
2. Clean up and remove mining materials as prioritized through the AML program in the Elmer allotment. Explore options to address undersized culverts and non-native trees, or consider disposal of the tract.
3. Clean up and remove the material dumped in the stream channel (Bradley Creek) in the Michel allotment. This will be done through the AML program on a prioritized basis.
4. Work with law enforcement to reduce unauthorized ATV use along stream reaches in the Revenue Commons AMP.
5. To address riparian concerns (see #1 above) on Antelope Creek, consider revising the common boundary between the Strawberry Ridge AMP and Windy Pass AMP allotments to include all of Antelope Creek in the Windy Pass allotment.
6. Coordinate with the USFS (Beaverhead-Deerlodge and Gallatin National Forests) to address resource concerns along Spring Creek in the Trail Creek AMP Allotment. Consider riparian juniper treatment along this reach.
7. Remove the existing undersized exclosure and construct a new exclosure capable of protecting the resources at Axolotl Lakes Spring.
8. Abandon the Lower Revenue Spring project due to inadequate flow, clean up the old material, and if necessary, construct an exclosure around the spring source.
9. Consider expanding the exclosure and installing a new tank at Montana 32 Spring. Install a bird ramp in the tank.
10. Explore management options to reduce impacts to Trail Creek Spring and associated spring brook. Consider treating juniper encroachment at this spring and leaving the downfall in a manner to prevent livestock use at the spring source.
11. Abandon the Wallace Spring project due to inadequate water flow and construct an exclosure at the spring source if necessary.
12. Complete the necessary work and documentation to authorize the Bar 7 Spring or abandon the project and clean up the area.
13. Determine if Easter Spring is on BLM administered land (extremely close to private property line). If it is on BLM administered land, either complete the work and documentation to authorize the project or abandon the project and clean up the project materials.
14. Explore options to reduce impacts at the undeveloped spring in the Axolotl Lakes allotment.
15. Explore opportunities to maintain water levels in Axolotl, Reservoir and Twin Lake through water leasing from current water right holders or improvements to current water control structures.

Water Quality

Western Montana Standard #3: *"Water quality meets State standards"*

Affected Environment

The MW assessment area lies within all of the Middle and the portion of the Lower Madison TMDL Planning area within Madison County. BLM administered public lands are a minor (4%) spatial component within the MW with the majority ownership being private, Forest Service, and State Lands.

Nonpoint Source Pollution (NPS) is the leading cause of surface water impairments in Montana. NPS pollutants are generated by the same land uses that have traditionally driven the state's economy, including grazing, logging, mining, roads and many other activities (MTDEQ 2007). Grazing on pasture and rangeland is one of the state's leading sources of NPS pollution. Principle pollutants of concern associated with grazing activities are bacteria, nutrients, sediment, and stream temperature alteration.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard
The Montana Department of Environmental Quality (DEQ), Water Quality Planning Bureau, and Watershed Protection Section provide guidance on assessing water quality in relation to NPS. Montana DEQ recognizes PFC as a qualitative method of assessing the condition of riparian-wetland areas. DEQ believes PFC is an effective tool for riparian assessment and evaluation of the impacts of grazing management and other authorized uses on riparian health. Montana's NPS Agricultural Strategy for Pasture and Range Lands supports the BLM's use of PFC for assessment. Montana DEQ publishes a Water Quality Report every two years. The information in this section is based upon the 2008 water quality report.

Findings and Analysis

In conducting watershed assessments, the BLM evaluates uplands for land cover (ability of plants, rocks, and litter to protect soil from erosion, promote infiltration and reduce runoff). PFC facilitates evaluation of channel erosion. Channel morphology, width and depth, bed materials, condition of stream banks and riparian vegetation provide information used to assess stream function, riffle stability, shear stress and sediment loads. Sediment and bacteria from animal waste can be concerns related to water quality. The less time livestock have access to streams the less sediment and manure generated bacteria there is to affect water quality.

According to Montana's 2008 integrated 303d/305b Water Quality Report, grazing in riparian and shoreline areas is the number one source of impairment in Montana. Stream NPS pollution is directly related to land use. Since farms and ranches cover two thirds of the state and agriculture is Montana's leading industry, it follows that the non point pollutant concerns would be associated with grazing. Montana DEQ has found that pollutants from agricultural nonpoint sources include sediment, nutrients, salinity, thermal impacts, bacteria and pesticides.

Table 6: Montana DEQ 303-d Listed Streams in the MW

Name	Beneficial Uses	Probable Sources of Impairment	Probable Causes of Impairment
Middle Madison – Quake Lake to Ennis Lake	Full Support of all Beneficial Uses. DEQ notes some minor concerns including with ice gouging, associated with interactions near Ennis Lake		
Ennis Lake	Agriculture[1], Aquatic Life [2], Cold Water Fishery [2], Drinking Water [3], Industrial [1], Primary Contact Recreation [2]	Natural sources, source unknown, acid mine drainage, impacts from abandoned mine lands, hydro structure flow regulation/ modification, habitat modification	Causes unknown, chromium, low flow alterations, physical substrate habitat alterations , other anthropogenic alterations
Lower Madison – Ennis Lake to confluence at Three Forks	Agriculture[1], Aquatic Life [2], Cold Water Fishery [3], Drinking Water [3], Industrial [1], Primary Contact Recreation [1]	Agriculture, impacts from abandoned mine lands, dam construction, dam or impoundment, hydrostructure flow regulation/ modification, natural sources	Alteration in streamside or littoral vegetative covers, copper, lead, sedimentation/siltation, temperature

[1] Fully Supporting, [2] Partially Supporting, [3]Not Supporting

The BLM understands that NPS pollution needs to be addressed for waters of the State regardless of whether they are meeting or are not meeting water quality standards. The BLM further understands that non-degradation rules apply to waters that meet state standards. Section 319 of the Clean Water Act addresses non-point source pollution through the application of Best Management Practices (BMPs). AMPs are recognized as BMPs to the extent they address non-point pollution (EPA2003). The BLM uses AMPs developed to improve riparian and upland conditions as an effective BMP to improve water quality. Western Montana Guideline #10 states "Livestock management should utilize BMPs for livestock grazing that meet or exceed those approved by the State of Montana in order to maintain, restore or enhance water quality." The BLM's responsibilities under the 1987 amendments of the Clean Water Act are to evaluate the effectiveness of their BMPs. The watershed assessment is an evaluation of BMP effectiveness. For the MW assessment, the IDT used a combination of methodologies to evaluate the watershed characteristics, as well as condition and function of floodplains, springs, streams, and wetlands. Upland and riparian assessments were used to determine how BLM management is affecting water quality. Upland indicators focus on condition and density of vegetative cover, erosion, and soil loss. Riparian indicators specific to streams evaluate channel dimensions, patterns and profiles, bed materials, access to floodplains, species composition and condition of riparian vegetation. Wetlands are assessed to determine their condition and ability to recharge ground water filter sediments and mitigate flooding. The assessment team also looks for evidence of current and historic mining, abandoned beaver dams, erosion from roads, and concentrated livestock waste. The IDT did not note any areas of concentrated livestock waste that would potentially affect water quality. Livestock waste was well dispersed throughout accessible areas of the allotments.

Refer to sections on upland and riparian health above for PFC determinations and information that helps indicate where BLM resource conditions and/or authorized uses may be either contributing to or mitigating water quality impairment. The State makes Beneficial Use Determinations. The BLM shares their findings to assist DEQ in making Beneficial Use Determinations.

Recommendations for Water Quality

1. Continue working with Montana DEQ and local Watershed Committees in the development and implementation of water quality restoration plans.
2. Continue to implement BMPs to address NPS pollution.
3. Continue to share Watershed Assessment findings with DEQ.

Recommendations under the Upland and Riparian Standards above would also improve water quality.

Air Quality

Western Montana Standard #4: *"Air quality meets State standards"*

Affected Environment

The 1977 Amendments to the Clean Air Act resulted in the development of Air Quality Classes under the provisions of Section 160, Prevention of Significant Deterioration. The MW is located within a Class II airshed. Class II airsheds are in attainment for all pollutants. Winds are predominantly out of the southwest, west and northwest.

Air Quality issues develop predominantly during wildfire season and center on sources of particulate emissions. Particulate Matter (PM), measured in microns, is a concern to human health. The closest population at risk in the vicinity is Ennis, located in Madison County. The U.S. Census population estimate for 2008 was 1057. Madison County's population estimate, also for 2008, was 7500. PM 10 and 2.5 are pollutants of concern. PM 2.5, because of its small size, can travel hundreds, even thousands of miles.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard

The Clean Air Act of 1990, as amended (42 U.S.C. 7401 et seq) and Executive Order 12088 requires the BLM to work with appropriate agencies to protect air quality, maintain Federal and State designated air quality standards, and abide by the requirements of State Implementation Plans.

The Environmental Protection Agency (EPA) has delegated the authority to implement the provisions of the Clean Air Act to the State of Montana. Determination of compliance with air quality standards is the responsibility of the State of Montana. To address the issue of wildland fire, the EPA developed the 1998 Interim Air Quality Policy for Wildland and Prescribed Fires

which required states to develop smoke management plans. Montana and Idaho responded by forming the Montana/Idaho Airshed Group and by developing the Montana/Idaho Smoke Management Program.

Findings and Analysis

Air quality issues in the planning area center mainly around smoke. Smoke contributors in the planning area include wildfire, prescribed fires, private debris burning, agricultural burning, slash burning, and wood burning stoves and fireplaces. Wildfire can produce short-term adverse effects on air quality. Air quality and visibility can deteriorate due to temporary air stagnation during wildfire events, which are most common during the months of July, August, and September. Concerns regarding human health revolve around smoke from wildland and prescribed fire.

Prescribed burning is done in accordance with the Montana/Dakotas Fire Management Plan and is coordinated with MT DEQ and the Montana/Idaho Airshed Group. During prescribed fire season, the Smoke Monitoring Unit supports the Montana/Idaho Airshed Group to prevent or reduce the impact of smoke on area communities, especially when that smoke could contribute to a violation of national air quality standards. During the summer wildfire season, the Smoke Monitoring Unit assists state and local governments in monitoring smoke levels and providing information about smoke to the public, firefighters, and land managers.

Recommendation for Air Quality

1. Continue to follow Burn Plans and to coordinate with the Smoke Monitoring Unit.

Biodiversity

Western Montana Standard #5: *"Provide habitat as necessary, to maintain a viable and diverse population of native plant and animal species, including special status species"*

Affected Environment

The assessment area provides seasonal and year-long habitat for a wide variety of species. Wildlife uses are enhanced by the interspersion and diversity of grasslands, sagebrush, riparian, rocky outcrops and forested areas. Specific habitat conditions and associated recommendations are also described above in the Upland Health and Riparian Health sections.

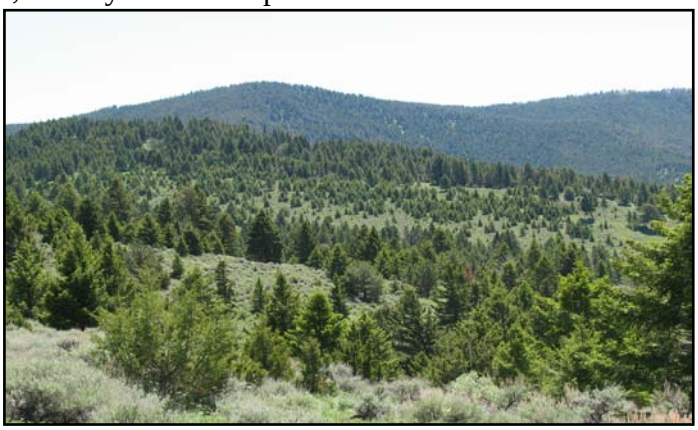
Sagebrush Habitats and Sagebrush Dependent Species

Sagebrush and grassland habitat types are the dominant vegetation communities in the analysis area, making up 56% of BLM administered lands. Of this, 11% is in the sagebrush/mountain shrub cover type and 45% is grassland. The sagebrush species in the watershed are Wyoming big sagebrush, mountain big sagebrush, black sagebrush, and three tip sagebrush. Mountain big sagebrush is the most common species in the MW. The variety of sagebrush provides habitat for pronghorn, mule deer, and sage grouse.

Mule deer are intermediate feeders, eating about equal proportions of woody browse and herbaceous forbs. In the winter mule deer depend on browse, especially big sagebrush, mountain mahogany, and Rocky Mountain juniper (Foresman, 2001). Sagebrush is also important forage for pronghorn, especially during the winter. In the spring, sagebrush and grasslands provide elk calving habitat.

The west side of the MW is mapped as suitable but unoccupied (historic) sage grouse habitat. The only known lek in the MW is on private land on the southern end of the watershed, but this lek is not currently active. Sagebrush is an important habitat component for sage grouse. It comprises nearly 100% of sage grouse winter diets and provides thermal, hiding, and nesting cover. When suitable habitat exists, sage grouse usually nest within two miles of a lek. Broods require a high protein diet of forbs and insects, usually found in riparian habitats. The *Management Plan and Conservation Strategies for Sage Grouse in Montana* is used as a guideline for sagebrush habitat management.

Conifer expansion into existing sagebrush habitat was noted in many areas at the forest-sagebrush ecotone. This expansion of forest can result in habitat conversion and a loss of sagebrush habitat. In part, this is likely due to the relative lack of fire during the past 120 years.



Conifer expansion in the Bear Trap Wilderness; June 2009

Riparian, Aquatic and Wetland Habitat and Associated Species

Riparian/mesic shrubs make up 1% of the BLM administered lands in the MW. Riparian areas provide important habitat for moose, elk, beaver, songbirds, and sage grouse. Riparian, aquatic, and wetland habitat offers habitat diversity in the otherwise sagebrush and grassland habitats and are crucial water sources for wildlife. Succulent forbs, largely found in riparian areas, are a key component of sage grouse brood diets. Wildlife and livestock concentrate in riparian habitat, as it provides green vegetation later into the summer and fall, resulting in a disproportionate amount of use in these areas. For at least some portion of their annual life cycle, about 75% of all wildlife species in this area utilize riparian habitat.

Riparian woodlands support the highest diversity of landbird species of all habitats. Riparian corridors are crucial to several northern-breeding Neotropical migrants and breeding or wintering species, even though they may not carry water year-round (Rich et al., 2004). The Partners in Flight Bird Conservation Plan for Montana lists 141 bird species for priority status in five habitat groups. The objective of this plan is "to focus on restoring healthy ecosystems that will sustain productive and complete bird communities" (Montana Partners in Flight, 2000). Most species are summer residents that use habitats ranging from lower elevation wetlands to high elevation forests for breeding and raising young. Some species are migratory, but small populations may stay yearlong depending on seasonal conditions. The USFWS has a list of 28 "Birds of Conservation Concern" for the Rocky Mountain Region, many of which depend on riparian habitat for all or part of their lifecycle.

Table 7 lists the 16 species that potentially occur within the MW.

Table 7: USFWS Birds of Conservation Concern

Swainson's hawk	Ferruginous hawk
Golden eagle	Peregrine falcon
Prairie falcon	Solitary sandpiper
Long-billed curlew	Marbled godwit
Williamson's sapsucker	Wilson's phalarope
Pygmy nuthatch	Flammulated owl
Brewer's sparrow	Lewis' woodpecker
Red-naped sapsucker	McCown's longspur

Within the MW there are 11 perennial streams and four lakes on BLM administered land that support cold water fisheries. Common sport fish species in the area are brook trout, Yellowstone cutthroat trout, rainbow trout, rainbow x cutthroat hybrids and mountain whitefish. Non-native species were introduced into the area in the late 1800's. Subsequently, populations of native cutthroat began to decline. Today, rainbow trout and hybrid cutthroat trout are commonly found in the lower to middle reaches of several streams. Eastern brook trout are common in the upper reaches of several streams.

Table 8 shows the fisheries streams and fish species present within the MW.

Table 8: Fisheries Streams and Fish Species Present

Streams	Species Present
Wigwam Creek	Rainbow trout, rainbow x Westslope cutthroat trout (WCT) hybrids
Arasta Creek	WCT x rainbow x Yellowstone hybrids (87% WCT)
Buffalo Creek	WCT x rainbow x Yellowstone hybrids (84% WCT)
Papoose Creek	Rainbow trout, rainbow x WCT hybrids (80% WCT)
Standard Creek	Rainbow trout, Yellowstone cutthroat
Washington Creek	Brook trout
Rattlesnake Creek	Brook trout
Pony Creek	Brook trout
Cataract Creek	Brook trout
Hot Springs Creek	Brook trout, Rainbow trout, brown trout
Madison River *	Arctic grayling, rainbow trout, brown trout, brook trout, cutthroat trout hybrids, mountain whitefish, white sucker, longnose sucker, longnose dace, mottled sculpin, stone cat, carp, Utah chub

*For the purpose of this document, the Madison River encompasses the stretch of river from river mile 24 upstream to river mile 93.

Axolotl Lakes

The Axolotl Lakes are small shallow mid elevation lakes primarily formed for irrigation water storage. Several of the lakes support popular recreational fisheries which contain several species of trout and arctic grayling.

Twin Lake has a small amount of shoreline administered by the BLM and is a very popular fishery for large rainbow trout that regularly produces fish in the five to eight pound class.

Reservoir Lake is the smallest of the lakes in the chain. It currently supports a limited recreational fishery for rainbow trout. Current management plans are to stop stocking non natives and convert the fishery to native WCT through stocking efforts by Montana FWP.

Axolotl Lake currently supports Yellowstone cutthroat trout that commonly exceed five pounds. In 2009, FWP began stocking the lake with native WCT and a small number of arctic grayling and stopped the stocking Yellowstone cutthroat trout.

For information on Blue Lake, see Blue Lake Area of Critical Environmental Concern above.

Generalist or Widespread Species

The MW lies within portions of Montana hunting districts (HD): HD 333, 320, 311, 330, 360, 323, and 362 for deer and elk; HD 311 and 360 for antelope; HD 320, 331, 313, 360, and 330 for moose; HD 320, 324, 325, 326, 327, and 328 for mountain goat; HD 301 and 302 (currently closed) for bighorn sheep.

Elk numbers within the Gravelly and Tobacco Root Elk Management Units (EMU) are within objectives, but had been slightly higher in the past couple of years in the Gravelly EMU (pers. comm. Brannon, 2009). For HDs 360 and 362, 2009 flight counts were down in comparison to the record high elk numbers counted in 2008 (pers. comm. Cunningham, 2009). The mule deer populations throughout the MW appear to be stable, but numbers are below the long-term nine year average on the east side of the Madison River (pers. comm. Brannon and Cunningham, 2009). White-tailed deer are common on the river bottoms by Ennis and Jeffers, but are less common around the rest of the valley (pers. comm. Cunningham, 2009). Antelope numbers are stable with good fawn recruitment and a liberal harvest (pers. comm. Cunningham, 2009). Moose numbers are down throughout Montana FWP Region 3. Parasites are a primary concern with moose, and FWP is collecting moose heads to analyze parasites within the moose population (pers. comm. Cunningham, 2009).

Table 9 shows the primary games species and their habitat use in the MW.

Table 9: Primary Game Species and Habitat Use

Species	Forested*	Sagebrush*	Riparian*
Pronghorn		**Y**	
Bighorn sheep		**Y**	
Black bear	**Y**		
Mountain lion	**Y**		
Elk	**S,C**	**W,C**	**Y**
Moose	**Y**	**Y**	**Y**
Mule deer	**S,C**	**W,C**	**W**
White-tailed deer		**S**	**Y**
Dusky grouse	**Y**		**Y**
Ruffed grouse	**Y**		**Y**
Sage grouse	**S**	**Y**	**B**

Species	Forested*	Sagebrush*	Riparian*
Hungarian partridge		**Y**	

*Y=yearlong, W=winter, S= summer, C=calving/fawning, B=breeding/brooding

Pronghorn antelope utilize sagebrush and grassland habitats year-round in the MW. Antelope winter throughout the Madison Valley on both sides of the Madison River below forested land and along sagebrush and grasslands on the east side of the Tobacco Root Mountains. Mule deer depend heavily on browse during the winter, choosing habitat with big sagebrush, mountain mahogany, and Rocky Mountain juniper. The Bear Trap Wilderness is important mule deer winter range. Scattered, isolated patches of curlleaf mountain mahogany are found on rocky slopes and ridges throughout the watershed. It provides year-round cover and forage for deer and is a crucial source of winter forage for many wildlife species. It is a good source of protein for wintering big game. Forests and adjoining sagebrush habitat provide winter range for mule deer and elk, while riparian bottoms provide yearlong habitat for white-tailed deer (Montana Fish, Wildlife and Parks, 2005b).

The MW is important elk winter range, with thousands of elk wintering in the valley. The Wall Creek WMA is crucial elk winter range, with a high count during the 2008/2009 winter of over 2,100 elk in January, and numbers fluctuating throughout the season and dwindling toward spring (pers. comm. King, 2009). BLM administered land on both sides of the Madison River on the eastern edge of the WMA is heavily used by elk during the winter. The BLM administered land on the east side of the river across from the WMA has become critical winter range for elk (pers. comm. King, 2009). BLM administered land on the east side of the Tobacco Root Mountains provides elk winter range, as well as allotments on the lower Madison River (Dehaan and Carter allotments). Winter habitat use is influenced by weather, hunting and predation pressure, snow depths and snow texture. Elk calving also depends on the weather and snow depths in the area. Elk may calve in the higher sagebrush basins, as well as BLM administered lands northwest of Lyons Bridge.

The bighorn sheep population in the Madison Range has maintained good numbers for several years. The bighorns summer higher in the Taylor-Hilgard and winter at lower elevations along the southern end of the Madison Range (pers. comm. Cunningham, 2009). Bighorns use BLM administered land east of Trout Creek in the southern Madison Range, and can be seen along Highway 287 near Quake Lake during the winter. Throughout the years, only one bighorn sheep has been seen by BLM staff in the Bear Trap Wilderness, while mountain goats are frequently observed. Black bear are common in the forested areas of the MW. One was seen during the field assessment in the Bear Trap Wilderness along Fall Creek.

Special Status Species

"Special Status Species" refers to both plants and animals and includes proposed species, listed species, and candidate species under the Endangered Species Act (ESA); State-listed species; and BLM State Director-designated sensitive species (USDI 2001). Special Status Species are vital to maintain watershed biodiversity. Table 10 lists all Special Status Species that occur within the MW during all or part of the year.

Table 10: Special Status Species

Animal Species	Current Management Status	Occurrence: Resident (R) Transient (T)	Preferred habitat
Arctic grayling	Sensitive	R	Ennis Lake and Madison River
Bald Eagle	Sensitive	R	Riparian/wetland
Black Tern	Sensitive	R	Wetland
Brewer's Sparrow	Sensitive	R	Sagebrush shrubland
Canada Lynx	Threatened	T	Forest
Common Loon	Sensitive	T	Wetland
Ferruginous Hawk	Sensitive	R	Sagebrush shrubland
Flammulated Owl	Sensitive	T	Forest
Franklin's Gull	Sensitive	R	Riparian/wetland
Golden Eagle	Sensitive	R	Riparian/wetland Sagebrush shrubland
Gray Wolf	Sensitive	R	All
Great Gray Owl	Sensitive	R	Forest
Grizzly Bear	Threatened	R	Forest
Long-billed Curlew	Sensitive	R	Grassland
Long-eared Myotis	Sensitive	R	Forest
Marbled Godwit	Sensitive	R	Mudflats, shoreline
McCown's Longspur	Sensitive	R	Grassland
Northern Goshawk	Sensitive	R	Forest
Peregrine Falcon	Sensitive	R	Riparian/wetland
Sage Grouse	Sensitive	R	Sagebrush shrubland
Sage thrasher	Sensitive	R	Sagebrush shrubland
Swainsons Hawk	Sensitive	R	Riparian/wetland Sagebrush shrubland
Trumpeter Swan	Sensitive	R	Riparian/wetland
Western Toad	Sensitive	R	Riparian/wetland/forest
Willet	Sensitive	T	Wetland
Wilson's Phalarope	Sensitive	R	Wetland
Wolverine	Sensitive	T	Forest
Plant Species	**Current Management Status**	**Known from BLM lands?**	**Habitat**
Railhead Milkvetch	Sensitive	Yes	Sagebrush steppe and grasslands
Spiny skeletonweed	Sensitive	Yes	Arid grasslands
Hiker's gentian	Sensitive	Yes	Fens, meadows and seeps

Tapertip onion	Sensitive	Yes	Dry, open forests and grasslands
Beaked spikerush	Sensitive	No	Fens, seeps and hot springs
Sitka columbine	Sensitive	No	Open coniferous and aspen forests
Beavertip draba	Sensitive	No	Moraine and fellfields near or above treeline
Meadow pennycress	Sensitive	No	Meadows in sagebrush steppe

Special Status Wildlife

Although there are nearly 600 individuals in the population, the Greater Yellowstone Area grizzly bear population was relisted under the ESA as threatened per the September 21, 2009 court order. The relisting is largely due to a decline in one of their food sources, the seeds of whitebark pine. Climate change, mountain pine beetle, and white pine blister rust are reducing whitebark pine numbers. Grizzly bear have been reported in the Tobacco Root Mountains, and are thought to be transient through the area. Grizzlies are resident in the Gravelly and Madison Ranges (pers. comm. Frederick, 2009).

Gray wolves were delisted from the ESA on May 4, 2009. Since delisting, a hunting season for wolves has been implemented in Montana. The MW is part of Wolf Management Unit 3 with a harvest quota of 12 wolves. The wolf hunting season in the MW occurred during the general deer and elk season from October 25-November 29, 2009. In 2008, a minimum estimate of 130 wolves in 18 verified packs existed in the Montana portion of the Greater Yellowstone Experimental Area (Sime et al. 2009). Eight wolf packs use the MW, with an additional suspected pack in the North Gravelly's (Sime et al. 2009). Conflicts between wolves and livestock are an issue, resulting in wolves being dispatched in the area.

Wolverines occur in coniferous montane forest types, preferring rugged, roadless, isolated habitats. Home range size for females and males averages 422 km^2 in Montana (Foresman, 2001). Wolverines are more likely to occur at higher elevations on Forest Service administered land in the MW, with transient individuals on BLM administered land. Canada lynx are listed as threatened under the ESA. Forest Service administered land above BLM in the MW may be potential Canada lynx habitat. BLM administered land in the MW provides linkage zones between potential habitats.

The bald eagle was removed from the federal list of threatened and endangered species on August 9, 2007, and is currently managed as a BLM sensitive species. Bald eagles are still protected under the Bald and Golden Eagle Protection Act. Bald eagles nest and concentrate in the winter along the Madison River and in areas where prey is available. Cooperative interagency monitoring is occurring through the Montana Bald Eagle Management Plan. Ferruginous hawks, golden eagles, and Swainson's hawks are common throughout the MW. Peregrine falcons nest on cliff ledges typically near riparian and wetland areas. Several have been observed along the Madison River.

The Brewer's sparrow and sage thrasher utilize sagebrush habitats. The McCown's longspur nests in dry, shortgrass prairies and winters on barren ground. Northern goshawk and great gray owl habitat consists of mature forests with clearings such as bogs, meadows, and wetlands for

foraging. Flammulated owls select open forest stands with large trees and snags for nesting, with adjacent openings that provide edge habitat for foraging. Long-eared myotis are associated with forests containing old-growth characteristics, but are also found in many habitats where suitable roosts exist. They roost in buildings, caves, mines, trees, and rock outcrops.

Western toads breed in any clean standing water and may wander miles from their breeding sites through coniferous forests and subalpine meadows, lakes, ponds, and marshes (Werner et al., 2004). Western toads have been documented along the Madison River corridor and at lakes in the Tobacco Root Mountains on Forest Service administered land.

Black terns, common loons, Franklin's gulls, marbled godwits, willets, Wilson's phalaropes, and trumpeter swans are associated with lakes, rivers, ponds, sandbars, and shoreline. In the MW these species are most commonly seen along the Madison River and Ennis Lake. Long-billed curlews nest on dry grassland and winter in marshes, fields, and beaches.

Westslope cutthroat trout (WCT) were historically found in most of the perennial streams within the MW. Competition with non-native species, hybridization with non-native rainbow and Yellowstone cutthroat trout, as well as habitat degradation, have combined to extirpate pure populations of WCT within the assessment area. There are currently no known occurrences of 90% or greater WCT populations located in the drainages within the MW area. Several streams within the assessment area contain populations of hybridized cutthroat that do not meet the management criteria for WCT. To meet this criterion a population of WCT must consist of individuals that are genetically at least a 90% WCT.
Historically the fluvial form of arctic grayling was found throughout the Madison River, with large numbers found in the area that Hebgen Lake now covers. With completion of the Ennis and Hebgen dams, the fluvial form of arctic grayling in this system has essentially disappeared. Today, there is a small population of primarily adfluvial arctic grayling that reside in Ennis Lake and the immediate three miles upstream of the lake. This population uses the lower portions of the Madison River primarily for spawning. The occurrence of grayling outside of this area is very rare. Occasionally anglers report catching grayling in areas upstream of this core area, but it is an uncommon occurrence.

The western pearlshell is Montana's only coldwater trout stream mussel. Populations of this mussel on the east side of the divide in Montana followed the historic distribution pattern of WCT. Once widespread through the upper Missouri River Drainage, only remnant populations remain within the Madison River and likely some populations remain in some tributaries. Recent surveys have shown significant declines as impacts related to agricultural runoff and siltation reduce available habitat. Additionally, impacts related to impoundments, diversions, siltation, and unstable substrate are also continued threats (Western Pearlshell, 2009). The western pearlshell currently has no special management status under BLM, but is listed as a special status species by Montana FWP and the Forest Service.

Special Status Plants
The upper MW has the largest known populations of Railhead milkvetch and Spiny skeletonweed in the state. Railhead milkvetch is a regional endemic known from southwest Montana, east-central Idaho and northwest Wyoming. Railhead milkvetch is palatable and may

decrease under some livestock grazing regimes. Spiny skeletonweed is a Great Basin species that occurs in Montana at the northeastern edge of its range, where it is known only from grasslands in the Madison and Centennial valleys. Grazing would likely favor this plant because it is probably unpalatable and would benefit from a reduction in competing palatable grasses. Both Railhead milkvetch and Spiny skeletonweed face competition from invasive species, especially leafy spurge, spotted knapweed, and cheatgrass.

A small population of Hiker's gentian was discovered in a fen on BLM administered land near the Madison River during the 2009 field assessment. Hiker's gentian is an annual herb with erect stems which may be only a few inches to up to 15 inches in height. This wetland obligate is vulnerable to changes in hydrology.

A historic population of Tapertip onion has been documented on BLM administered land near the Trail Creek trailhead, but no plants were observed during an attempt to relocate this population in June of 2009.

Large-leafed balsamroot and Dwarf purple monkeyflower are BLM sensitive plants that haven't been documented within the MW but suitable habitat exists within the watershed and both species are known from near-by Forest Service administered lands.

Noxious Weeds and Invasive Species

Noxious and invasive weeds are one of the primary resource concerns within the MW. Weeds affect land health in varying degrees in riparian and upland habitats. They also reduce biodiversity in isolated areas while posing widespread risk to the biodiversity of many additional locations in the watershed. Because of the aggressive and competitive nature of these noxious weeds, they have spread throughout the watershed, primarily along road systems, utility corridors, and other disturbed areas, but have also encroached into some undisturbed upland areas.

Noxious weeds found within the MW that are of primary concern include leafy spurge, spotted knapweed, hoary alyssum and houndstongue. Infestations of leafy spurge, a very aggressive noxious weed with an extensive root system, are found primarily north of Ennis Lake, along drainage bottoms, but also scattered in some uplands. Spotted knapweed, an aggressive perennial invader and a prolific seed producer, is found in large infestations scattered throughout the watershed especially along the Madison River, roads, streams, recreation sites and other disturbance areas. Because of where it is found, the potential is high for knapweed to be spread by vehicles, livestock, wildlife, recreation and other activities. Hoary alyssum, a perennial from the mustard family that became more pronounced and invasive due to the recent drought in most of southern Montana, is found primarily in recreation sites and areas of disturbance. Houndstongue is scattered throughout the watershed, primarily along riparian bottoms, roads and trails. Houndstongue is toxic to animals due to high levels of alkaloids contained in the plant. Due to the difficulty in treating infestations found in riparian areas and because of its seeds ability to cling to hair and clothing, the potential is high for it to be spread to disturbed areas within the watershed. Houndstongue is an opportunistic invader (moves into disturbed areas), not an aggressive invader like spotted knapweed.

Other noxious or invasive weeds present in widely scattered infestations include black henbane, common tansy, and Canada thistle. Black henbane is found primarily along roads within the area, common tansy is found mostly in riparian areas around Pony, and Canada thistle is common in riparian bottoms that have had disturbance.

Since 1989, BLM has been involved in cooperative weed management efforts with Madison County and some private landowners. Throughout this period, the goal has been to prevent new noxious weed infestations and control or eradicate existing infestations in the watershed using Integrated Pest Management.

In 2004, the BLM entered into a project with the Madison Valley Ranchlands Group, the Montana Sheep Institute, Montana FWP, Madison County and various private landowners to graze spotted knapweed with sheep along a seven mile stretch of the Madison River from McAtee Bridge to the Palisades Recreation area. In 2005 the project was expanded to include the Story property just north of the Indian Creek ranch and has been continued through 2010. This project has shown that when sheep graze knapweed before seed set, seed production can be reduced by as much as 80%. Table 11 shows the acreage of BLM applied herbicide treatments, and acres inventoried for weeks in the MW during the past five years.

Table 11: Recent Weed Inventories and Treatments

Year	Acres Treated	Acres Inventoried
2005	387	9500
2006	365	8400
2007	475	8800
2008	395	11700
2009	71	16700

Cheatgrass, a winter annual invasive species, is also a concern within the MW. It is currently found in small patches throughout the watershed in disturbed areas, past wildfire areas, riparian bottoms and adjacent south facing slopes. Relatively large infestations were observed by IDT in some of the major stream corridors and adjacent uplands, specifically on south or west facing slopes. Cheatgrass is an extremely competitive early cool season species that flourishes in disturbed sites. Old mining sites, roads, construction locations, burned areas and other disturbed areas have allowed cheatgrass to become established. Once established, cheatgrass has the potential to change (shorten) the fire return interval because it dries out in early summer and becomes a fine, flashy fuel. Cheatgrass tends to form monocultures. It currently affects habitat quality and biodiversity in localized areas, but the seed source is present throughout most of the watershed, so could potentially spread into new areas of natural and/or human caused disturbance.

Invasive Aquatic Species

The New Zealand mud snail is a small non native freshwater snail first identified in the U.S. in the Snake River in 1987. Very shortly thereafter they were found in the Madison River, likely introduced via a fisherman's waders. Mud snails create a problem due to their very high reproductive success and their high densities, in some cases in excess of 500,000 per square

meter of stream bottom. At these densities they strip the algae, causing declines in native snails and aquatic insect populations, which in turn impacts fish populations. Currently there is no way to control current infestations. Education of fishermen is the best way to prevent further spread of this species (Benson and Kipp, 2009).

Whirling disease, first described in Germany in 1903, was first found in the U.S. in the 1950s, and was first confirmed in the Madison River in 1994, though was certainly present for several years prior. When it made its first appearance, it rapidly made its presence known, nearly wiping out the rainbow trout population in the river in its first few years.

Whirling disease is caused by a parasite. In the spore form it is eaten by small tubifex worms. While in the worms gut, the spore opens, which releases the second stage of the parasite. Several months later it metamorphoses into a stage call a TAM. At this stage it is capable of infecting the nervous system of young trout less than three months old. After this age, most cartilage has turned to bone and is no longer susceptible to as much damage. TAMs are generally found in the river at concentrations high enough to cause infection from mid May through July. This overlaps very well with the presence of rainbow trout fry in the Madison drainage. Due to spawning times and fry emergence times, rainbow and cutthroat trout are most susceptible to infection and are therefore the species most likely to show a decline (Kipp R.M 2009).

Eurasian watermilfoil, an aquatic invasive plant, forms large sub-surface or surface mats that can impede water flows, interfere with boat traffic and recreational activities, create mosquito habitat and displace native vegetation. Due to the ability of this plant to reproduce vegetatively by rhizomes, stem fragments and axillary buds, the potential is high for it to spread into uninfested waterways.

Eurasian watermilfoil was first introduced to the United States in 1942 in Maryland possibly as an escaped aquarium plant. The first known infestation in Montana was recently discovered in the Noxon and Cabinet reservoirs in Sanders County. However, the biggest threat to the MW comes from an infestation that has been found in Henry's Lake in northeast Idaho, which could be transported by recreationists into the Madison River drainage

Forest and Woodland Habitat and Associated Species

Forest and woodland habitats comprise approximately 33% of all ownerships, and approximately 39% of BLM administered lands within the MW. Effective precipitation and aspect influences the establishment and composition of forests and woodlands. The close association of forests with adjoining sagebrush and riparian habitats supports a broad array of wildlife species. This habitat provides important thermal and hiding cover, including security habitat for big game.

Forests in the MW provide habitat for a large variety of species including mountain lions, dusky grouse, ruffed grouse, northern goshawk, black bear, bobcat, and wolverine. This habitat provides important linkage corridors for grizzly bears, Canada lynx, gray wolf and other large carnivores. Forest-dwelling bird species require suitable nesting and foraging habitat. Several bird species help protect forests by eating millions of damaging insects, such as the western spruce budworm.

Limber pine, Rocky Mountain juniper, Douglas-fir, and curlleaf mountain mahogany woodlands are present on drier, rocky slopes and lower elevations. The scattered patches of mountain mahogany found on rocky slopes and ridges throughout the watershed provide year-round cover and forage for deer and are a crucial source of winter forage for many wildlife species. Mountain mahogany is also a good source of protein for wintering big game. Limber pine is found on some of the driest sites capable of supporting trees (Pfister et al, 1977), and is often found with Douglas-fir and juniper. Limber pine seeds provide critical food for rodents and birds, including squirrels and Clark's nutcrackers, which also cache the seeds for later use. Other birds, small mammals, and bears benefit from these caches.

Common habitat types found on lower elevation forested slopes in the MW are Douglas-fir/pinegrass, Douglas-fir/snowberry, Douglas-fir/white spiraea, Douglas-fir/heartleaf arnica, and Douglas-fir/elk sedge. Areas of Douglas-fir/bluebunch wheatgrass, Douglas-fir/Idaho fescue, and Douglas-fir/common juniper habitat types were found on drier sites, and areas of Douglas-fir/ninebark habitat types were found on moist sites above the Madison River. The Douglas-fir habitat types found on drier slopes may contain some component of juniper, limber pine and/or whitebark pine. Lodgepole pine is present in varying amounts, but is generally more prevalent at higher elevations or more moist subalpine fir habitat types.

The majority of the lower elevation forest types are single story, closed canopy stands consisting mainly of Douglas-fir trees 150 years or less in age, with intermixed lodgepole pine, and spruce. Some stands also contain scattered "relic" Douglas-fir trees greater than 200 years old. Growth ring analysis of a sample of these older trees shows that diameter growth slowed at about the same time the young cohort of Douglas-fir trees established in these stands. Comparing historical photographs to current conditions shows an increase in tree density within stands, a loss of mountain meadows, and decline or loss of upland aspen stands (Gruell, 1983). The increased density within stands has resulted in trees competing for limited nutrients and moisture, leading to reduced vigor and growth of individual trees.

Mid to upper elevation forests are generally the transition zone from Douglas-fir to lodgepole pine, Engelmann spruce, subalpine fir, and eventually whitebark pine. Within the MW, subalpine fir habitat types include all forests potentially dominated at climax by subalpine fir or whitebark pine. According to Pfister et al (1977), lower limits of these habitat types are where slopes are not moist or cool enough to support subalpine fir, and it gives way to spruce or Douglas-fir types. At higher elevations this series forms the timberline, which is bordered above by alpine tundra. On especially dry, warm, windy exposures on the east side of the Continental Divide, this series sometimes gives way to subalpine grassland (e.g. Windy Pass). Higher elevation lodgepole/spruce/subalpine fir forest provides summer habitat for mule deer and elk, and yearlong habitat for moose and large carnivores.

Common habitat types found on mid to upper elevation forest slopes in the MW are subalpine fir/grouse whortleberry, subalpine fir/pinegrass, and subalpine fir/heartleaf arnica. Typically in the MW, the overstory in these habitat types is dominated by lodgepole pine, with subalpine fir regeneration in the understory. There may also be scattered large, "remnant" Douglas-fir, surrounded by even-aged lodgepole pine, particularly in the subalpine fir/pinegrass habitat type. The occurrence of mature, even-aged (approximately 80-120 years old) stands of lodgepole pine

is generally attributable to a historic stand-replacing fire, which may have followed a severe outbreak of mountain pine beetle.

In the upper subalpine region on BLM administered lands in the MW, the subalpine fir-whitebark pine/grouse whortleberry habitat type is dominant. These areas are comprised of subalpine fir, whitebark pine, and spruce; lodgepole pine is a major seral species at lower elevations.

Spruce is found in most forested habitat types, either scattered throughout, or concentrated in wetter areas. A hardwood component, including quaking aspen, Rocky Mountain maple, chokecherry, willow and alder, may also be found in the wetter forested areas or around springs. Aspen stands are relatively minor in area but are an important component on the landscape for wildlife values.

Lodgepole pine and aspen regeneration in the Corral Creek Fire; August 2009

Throughout BLM administered lands in the MW, there is very little forested area that is in the early and mid-seral stages (i.e. seedling, sapling and pole-sized trees), with the exception of previously treated areas and those burned by wildfire. Small patches of young (~20 years old) healthy lodgepole pine resulting from previous harvest treatments were noted in the Windy Pass AMP and Strawberry Ridge allotments. In the Corral Creek allotment, where the Corral Creek wildfire burned in 1988, extensive lodgepole pine and aspen regeneration covered the previously burned hillsides.

However, the majority of forested stands, in all habitat types, are in late-seral stages and are experiencing mortality from forest insects and disease, or are highly susceptible to insect outbreaks.

Forest Insects and Disease

There are many species of insects and disease that play a role in forested habitats. Only the major forest insects and diseases causing widespread disturbance in the MW are discussed here.

Mountain pine beetle is a native bark beetle which attacks most native and introduced species of pines (Hagle et al, 2003). At endemic levels, mountain pine beetle typically survives in stressed, weakened, or previously damaged trees, and causes minimal mortality. However, mountain pine beetle populations can build and spread quickly under favorable conditions. At epidemic levels, mountain pine beetle can decimate mature forests, often killing virtually all trees over extensive areas (Worrall, 2000). Outbreaks often occur in lodgepole pine stands that contain well-distributed, large diameter trees (Amman et al, 1990). Throughout the MW, most lodgepole pine are greater than 80 years old and are in the larger diameter classes. Epidemic mountain pine beetle activity is resulting in mortality of most of this mature (>6" DBH) lodgepole pine. While some of these trees are still green, most exhibit evidence of successful beetle attack. In some areas of the MW, lodgepole as small as 3" DBH showed sign of successful attack by mountain pine beetle.

Lodgepole pine mortality from mountain pine beetle, Strawberry Ridge; July 2009

Mountain pine beetle is also attacking and killing limber and whitebark pine in the MW. In addition to the mountain pine beetle, the exotic white pine blister rust fungus attacks limber and whitebark pine and results in additional mortality of these species. Limber pine mortality is variable throughout the watershed: some places have extensive mortality and a species conversion to Douglas-fir and/or juniper is likely (e.g. Strawberry Ridge allotment, Axolotl Lakes allotment). In other places, limber pine mortality is scattered and there are still many healthy-looking limber pine trees intermixed on the same site (e.g. Jourdain Creek allotment). Whitebark pine has experienced extensive mortality in the MW, and in many places has become non-existent or has been replaced by subalpine fir. The live whitebark pine that remain are at high risk of mortality from white pine blister rust and/or mountain pine beetle.

Western spruce budworm is a native defoliating insect which is present in the MW. Defoliation caused by spruce budworm is most evident on Douglas-fir, but also affects subalpine fir and spruce species. Throughout the watershed, defoliation caused by spruce budworm is generally low to moderate. However, some areas have experienced severe defoliation which has resulted in mortality of Douglas-fir trees (e.g. Willow Creek allotment).

Forest Service Insect and Disease aerial detection surveys show that spruce budworm activity was high in the MW in the mid-1980's, dropped off in the 90's, and picked up again starting in about 2002. Western spruce budworm is favored by dry summer conditions and mild winters, and has the greatest impact on trees that are stressed from dense stocking, found in multi-storied stands, and/or are impacted by drought conditions (Kamps et al., 2008). Budworms grow more vigorously in stressed trees, and budworm populations can increase dramatically during drought conditions. Prolonged budworm epidemics cause reduced diameter and height growth (Bulaon and Sturdevant, 2006). While spruce budworm does not usually cause direct tree mortality, it will predispose trees to attacks by other insects or diseases, and repeated heavy defoliation has resulted in mortality in other areas of the Field Office. The spruce budworm hazard rating is high throughout the watershed due to suitable stand conditions.

Heavy defoliation of Douglas-fir from spruce budworm (foreground) and mortality of lodgepole pine from mountain pine beetle (background), Willow Creek allotment; July 2009

Douglas-fir beetle is a native bark beetle which kills Douglas-fir trees, preferring mostly large diameter Douglas-fir trees growing in mixed or pure stands. Douglas-fir trees most susceptible to attack from Douglas-fir beetle are those larger than 14" DBH, older than 120 years, and growing in dense stands (Weatherby and Their, 1993). Douglas-fir beetle normally kills small groups of trees, but at epidemic levels may kill groups of 100 trees or more (Schmitz and Gibson, 1996). Forest Service Insect and Disease aerial detection surveys shows endemic Douglas-fir beetle activity in the watershed, with an increase in activity beginning in about 2000. The more recent Douglas-fir beetle activity mapped by the aerial surveys is predominantly on non-BLM lands. On BLM administered lands, small patches of older mortality from Douglas-fir beetle were noted in the Willow Creek, Wallace Peak AMP, and Aspen Creek allotments. There was little recent Douglas-fir beetle activity

Recent Douglas-fir beetle caused mortality, Sugarloaf Mountain; July 2009

noted on BLM-administered lands during the 2009 field assessment. However, most Douglas-fir stands in the MW have a high hazard rating for Douglas-fir beetle due to susceptible stand conditions.

Western balsam bark beetle is a native bark beetle which attacks subalpine fir. Patches of recent and older subalpine fir mortality, likely from balsam bark beetle, were noted throughout upper subalpine habitats in the MW. Forest Service Insect and Disease aerial detection surveys show balsam bark beetle had a more recent burst of activity in the MW starting in about 2000. According to Kegley, 2006, "root disease, old age, and weather damage may also contribute to success of western balsam bark beetles in stands."

There are also many species of dwarf mistletoes which affect tree growth and vigor. Mistletoes are parasitic plants which form shoots on branches or stems of host trees. Damage caused by mistletoe may include top kill, stem infections, reduced height and diameter growth, reduced cone and seed production, and increased susceptibility to other damaging agents (Hagle et al, 2003, Taylor and Mathiason, 1999). Evidence of mistletoe was noted on limber pine, Rocky Mountain juniper, and subalpine fir species. Mistletoe is also likely to be found on lodgepole pine.

Historical Fire Regimes

Fire exclusion, caused primarily by fire suppression and the removal of fine fuels by livestock grazing in the area since the 1860's, has changed the structure, density, and plant species composition within the MW. The need for and subsequent harvesting of forest products to support mining and agricultural activities in the late 1800's and early 1900's also greatly affected forest distribution, species composition and structure. The extent of harvest, particularly across the lower slopes of the Tobacco Root Mountains, has likely played a major role in restricting fires.

The change in forest structure, as well as increased insect and disease activity, leads to a higher likelihood of high-intensity fires occurring in areas that historically experienced more mixed-severity fires. Due to increasing fuel continuity, fires are also more likely to be of significantly greater size than those which historically occurred. Large-scale, high-severity fires present risks to human life and property, watershed stability and fish and wildlife habitat.

In fire adapted ecosystems, recurrent fire is the dominant disturbance that affects vegetation patterns. One method to describe this disturbance is using historical fire regimes (Table 12). The fire regime concept is used to characterize the personality of a fire in a given vegetation type, how often it visits the landscape, the type of pattern created, and the ecological effects. The historical fire regimes for the watershed are arranged based on fire severity and fire frequency.

Table 12: Historical Fire Regimes for BLM Administered Forested Lands

Historical Fire Regime	Severity (% Overstory Replacement)	Fire Interval (Years)	BLM Acres	% of BLM Forested	Representative Ecosystem
NL – non-lethal	low - <20%	10 to 25	1,954	13%	Dry pine, conifer encroachment and juniper forests
MS1 – mixed severity, short interval	low - 20-30%	20 to 40	2,742	18%	Lower elevation conifer forests
MS2 – mixed severity, long interval	mod - 30-80%	40 to 120	3,507	23%	Shrublands, mixed conifer forests
MS3 – mixed severity, variable interval	variable - 10-90%	45 to 275	111	<1%	Higher elevation conifer forests
SR1 – stand replacement, short interval	high - >80%	95 to 180	7,055	46%	Certain lodgepole pine, dry Douglas-fir forests
SR2 – stand replacement, long interval	high - >80%	200 to 325	23	<1%	High elevation whitebark pine, spruce-fir

* Acreage discrepancies may occur through calculations made in GIS.

Current Condition Classes

Fire Regime Condition Class (FRCC) is a classification of the amount of departure from the natural fire regime (Hann and Bunnell 2001). Coarse-scale FRCC classes have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2002), based on a relative measure describing the degree of departure from the historical fire regime. This departure is from changes to one or more of the following ecological components: vegetation characteristics (e.g., species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g., insect and disease mortality, grazing, and drought).

Three Condition Classes (CC) were developed to categorize the current condition with respect to each of the historic Fire Regime Groups. The three classes are based on low (CC 1), moderate (CC 2), and high (CC 3) departure from the natural (historical) regime (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). Criteria used to determine current condition include the number of missed fire return intervals with respect to the historic fire return interval, and the current structure and composition of the system resulting from alterations to the disturbance regime. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside. The relative risk of fire-caused losses of key ecosystem components increases as condition class designation increases.

The FRCC classifications for the MW based on the coarse-scale data presented in Table 13 is valuable information to aid managers in estimating actual ground conditions. However, due to the limits of satellite-based imagery the coarse-scale estimates presented in Table 13 may differ from site-specific assessments made by members of the IDT. For example, the coarse-scale assessments obtained through satellite imagery do not take into account finer scale factors influencing condition class such as recent insect and/or disease outbreak, individual stand structure and associated biodiversity issues.

Table 13: Fire Regime Condition Class for BLM Administered Lands

Condition Class	Description	BLM Acres*	% of BLM Forested	Example of Typical Management
1	Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range. Fires burning in CC1 lands pose little risk to the ecosystem and have positive effects to biodiversity, soil productivity, and hydrologic processes.	10,809	70%	Historical fire regime is replicated through periodic application of prescribed fire or through fire use.
2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased) resulting in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Wildland fires burning in CC2 lands can have moderately negative impacts to species composition, soil conditions, and hydrologic processes.	24,544 (NOTE: Actual forested cover in CC2 is approx. 2,090 acres. The remainder is sagebrush and grasslands.)	14%	Moderate levels of restoration treatments are required, such as a combination of prescribed fire with mechanical/hand treatment.
3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range. Wildland fires burning in CC3 lands may eliminate desired ecosystem components, exacerbate the spread of unwanted non-native species, and result in dramatically different ecological effects compared to reference conditions.	2,493	16%	High levels of restoration treatments, such as mechanical treatments, are required before fire can be used to restore desired ecosystem function. Intensive efforts, which may include seeding, herbicide application, biomass removal, and other types of rehabilitation, are required for CC3 lands.
Current conditions are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, grazing, introduction, and establishment of exotic plant species, insects or disease (introduced or native), or other past management activities (Laverty and Williams 2000).				

* Acreage discrepancies may occur through calculations made in GIS.

Findings, Analysis and Recommendations

Procedure to Determine Conformance with the Standard

This Standard is an overall assessment of biodiversity and plant and wildlife habitat. The present state of each allotment and habitat type was compared to the natural and historic condition. The indicators described under the definition of Standard #5, as well as condition/function of the other standards, specifically uplands and riparian, were considered to determine whether or not the Biodiversity Standard was met. The IDT considered the range of natural variation within this ecosystem as well as the species composition, condition of available habitat, and forest health to determine the condition/function of biodiversity.

Findings and Analysis

Sagebrush Habitats and Sagebrush Dependent Species

The only known sage grouse lek in the MW is on private land in the southern portion of the watershed. This lek has been inactive since the late 1980's/early 1990's (pers. comm. Frederick, 2009). No birds have been on the lek in recent years and monitoring has been difficult due to snow pack. Sage grouse have been seen during the nesting and brood-rearing seasons in the southern-most portion of the MW around Missouri Flats (pers. comm. Frederick, 2009). Sage grouse are found on summer habitat all across Virginia City Hill, including Axolotl Lakes WSA and to the north off Highway 287 (pers. comm. Roscoe, 2009). There is sage grouse habitat north of this area along the east side of the Tobacco Root Mountains, however there are no reports of sage grouse recently in the area. No sage grouse or sage grouse sign was found during field assessments in the summer of 2009 in any of the MW allotments, including a separate assessment by the BLM Wildlife Biologist in the Revenue Common AMP, North Meadow Creek, and Easter allotments. Sagebrush habitat in the MW is in good condition, however, besides the areas mentioned above, sage grouse presence in the watershed is unknown and rare at best.

Pygmy rabbits, another sagebrush obligate sensitive species in the Dillon Field Office, are not documented in the MW. No pygmy rabbits or sign were found during the 2009 field assessment and none of the wildlife professionals contacted in this area have seen them in the MW. The Montana Natural Heritage Program has not surveyed for them in the MW due to a large distance from known populations and a general consensus that pygmy rabbit habitat in the MW is lacking, as pygmies need dense sagebrush for a reliable food source and deep alluvial soil for digging their burrows (pers. comm. Maxell, 2009).

Some areas that are currently sagebrush and grasslands may be converted to forest or woodland cover types with continued expansion of conifers. In the continued absence of fire, mountain sagebrush and grasslands in southwestern Montana are likely to become more homogenous as Douglas-fir trees continue to encroach (Heyerdahl et al, 2006).

Riparian, Aquatic and Wetland Habitat and Associated Species

There is an active beaver dam along the east side of the Madison River in the Wall Creek AMP, which has created a pond. This is also a wetland area with several potholes. The willows in this

allotment along the Madison River are heavily browsed, with a lot of elk and moose sign. This area has become important elk winter range in recent years (pers. comm. King, 2009).

Functionality and habitat conditions of the majority of fish bearing streams assessed were found to be meeting standards and were in good or improving condition. Fishery habitat condition is directly linked to existing riparian conditions. Impacts that cause riparian habitat to not be in PFC condition also generally will result in low quality fish habitat. The main impacts affecting fishery habitat within the MW were found to be related to livestock impacts. For detailed description of impacts related to stream functionality refer to the Riparian findings and analysis section (Standard #2) above.

The primary issue affecting fishery habitat on the Madison River occurs as a result of fluctuating stream flows related to water discharge from the dams on Hebgen and Ennis Lakes. Stream temperature, sediment levels and dissolved gas are all affected by the water releases from the dam. With recent good water years, spring "flushing flow" releases have been incorporated into the operation of the dams to mimic traditional spring flows. This has resulted in improvements to spawning habitat as high flows scour and deposit clean gravels, as well as improvements to slack water fry habitat areas along the river margin. These "flushing flows" somewhat mitigate the impacts from the regulated flows typically emanating from these dams. One stream reach (#2019) was found to have appreciable impacts to stream banks as a result of excessive livestock use. However, due to the scale of this stream reach in relation to the river in whole, it is very unlikely that any appreciable impact to fisheries habitat is resulting.

Generalist or Widespread Species

The Shirley allotment uplands were rated in FAR condition due to cheatgrass, leafy spurge, spotted knapweed, and houndstongue. This area is mule deer winter range, with elk winter use as well. The noxious and invasive species infestations have lead to a reduction in cool season bunchgrasses important for elk winter range.

The McAtee Bridge, North Morgan, and Bar Seven allotments uplands were determined to be FAR due to a reduction in cool season bunchgrasses and an increase in blue grama and club moss. The change from bunchgrasses such as bluebunch wheatgrass to blue grama reduces forage for elk wintering on these allotments. Additional resource concerns affecting Biodiversity on the McAtee Bridge, Shirley, Sitz, and Michel allotments are discussed under the Uplands section (Standard #1) above.

The Biodiversity in the upland plant communities on the Flying D allotment are impacted by widespread leafy spurge infestations. This deep-rooted aggressive introduced noxious weed is scattered throughout BLM administered lands in the allotment. BLM land on Red Mountain is inundated with spurge and it has established on public land recreation sites along the west side of Madison River. In July of 2009, BLM released two species of leafy spurge flea beetle *(Aphthona lacertosa* and *Aphthona nigriscutis)*on Red Mountain.

Net-wire and barbed-wire fences that are no longer in use represent an entanglement hazard, especially for antelope, deer, and elk and moose calves. Barbed wire fences with more than four wires, wires spaced too closely, or wires higher than 40-inches or lower than 16-inches hinder

wildlife movement between pastures. Fences for modification, removal, or rebuilding have been identified in several MW allotments. In the summer of 2009, some dysfunctional fences were removed in the Palisades and Story areas.

Spring developments are an important water source for wildlife, but associated tanks can be fatal when escape ramps for birds and small mammals are not installed in them. Some spring developments were found to be in disrepair and some stock tanks lack escape ramps. Specific information is available under the Riparian section (Standard #2) above.

Special Status Species
The relisting of the Greater Yellowstone Ecosystem grizzly bear population as threatened under the ESA was largely due to whitebark pine declines. Whitebark pine was dead or dying in Strawberry Ridge, Axolotl, and Windy Pass AMP allotments.

BLM land in the MW provides corridors between potential Canada lynx habitat on Forest Service administered lands at higher elevations. Canada lynx distribution is largely tied to snowshoe hare occurrence. Snowshoe hare require dense, multi-layered understory with a high density of young conifer stems and/or branches that provide cover and browse at ground level and at varying snow depths throughout the winter (Ruediger et al., 2000). The age class of conifers required for snowshoe hare habitat is uncommon on BLM administered lands in the MW.

Forest and Woodland Habitat and Associated Species
Some limber pine habitats have undergone extensive mortality of limber pine and a species conversion to Douglas-fir and/or juniper is likely. The food source for wildlife dependent on limber pine seeds will be reduced as limber pine dies. Loss of limber pine is a concern in the Axolotl Lakes and Strawberry Ridge allotments.

The structure of Douglas-fir habitat types has been altered from the historic range of variation to become more homogenous with a higher dominance of late seral, closed canopy structure. These stands have high hazard ratings for spruce budworm and Douglas-fir beetle. Douglas-fir beetle activity was a concern in the Willow Creek, Aspen Creek, and Wallace Peak AMP allotments, and the Bear Trap Wilderness due to historic Douglas-fir beetle activity and high stand susceptibility. Densities within Douglas-fir stands have increased, and there has been a loss of mountain meadows and aspen due to conifer expansion. Upland aspen loss was a concern in the Strawberry Ridge and Aspen Creek allotments.

Lodgepole pine stands do not exhibit age class variety throughout the landscape. The majority of lodgepole pine stands are 80 years or older. Where lodgepole pine is a minor component of the forest (e.g. Douglas-fir habitat types), mountain pine beetle has resulted in scattered mortality of pine species only. However, where lodgepole pine is a major component of the species composition (e.g. subalpine fir habitat types), mortality is extensive. Epidemic mountain pine beetle activity is causing extensive mortality of lodgepole pine in the Axolotl Lakes, Windy Pass, Strawberry Ridge, Aspen Creek, Willow Creek, Preacher Creek, and Wallace Peak AMP allotments, and the Bear Trap Wilderness.

Whitebark pine is rapidly declining throughout most of its range in western North America, and has disappeared entirely in some isolated locations (Kendall and Keane, 1993). All whitebark pine habitats in the MW are at high risk of loss due to extensive mortality and lack of disturbance to stimulate regeneration. These habitats are important for many wildlife species, and are a key component of biodiversity. The decline of whitebark pine habitats is a major biodiversity concern in the Axolotl Lakes and Windy Pass allotments.

The fire return interval has been exceeded in all historical fire regimes in the MW, with the exception of higher elevation forested habitats (historical fire regimes MS3 and SR2). This has changed the structure of these habitats, and will result in future fire behavior being altered from that which occurred under the historical fire regimes. Throughout the MW, there has been a reduction in the amount of early and mid-seral successional stage forested habitat. The loss of variety of successional stages across the landscape reduces the ability to provide for biodiversity, and increases the susceptibility to widespread insect and disease outbreaks.

Based on the coarse-scale FRCC analysis, site-specific FRCC assessments, and historic photos of the area, the IDT has determined that lower elevation forested portions of the MW are severely departed from the historic range of variation, and higher elevation forested portions of the MW are moderately departed from the historic range of variation.

Recommendations for Biodiversity

Recommendations under the Upland and Riparian Standards above would also improve Biodiversity.

1. Modify old net-wire fence, dilapidated fence, and fences with improper wire spacing to meet wildlife-friendly specifications and ensure that new fences are built to BLM specifications. Remove any unnecessary fences and work with private landowners to improve BLM-private boundary fences to meet BLM specifications.
2. Continue to check and maintain wildlife escape ramps in all stock tanks in the watershed.
3. Revise livestock management in North Morgan, Bar Seven, and McAtee Bridge allotments to enhance cool season grass production.
4. Explore opportunities to reduce conifer expansion into sagebrush/grasslands.
5. Inventory & map the Hiker's gentian population discovered on BLM in 2009. The inventory should include the number of individual plants, a description of the habitat (e.g., associated species, soils, aspect, elevation) and an assessment of any existing and potential threats to the population.
6. Continue to work with Montana FWP and PPL on flow regulations of the Ennis Lake and Hebgen Lake dams to improve water quality and fisheries habitat.
7. Explore opportunities with Montana FWP and the Forest Service to re-establish genetically pure WCT in Arasta, Buffalo Creeks or other suitable habitat.
8. Recommend adding the western pearlshell to BLM's Special Status Species list.
9. Continue to address localized weed infestations in the MW assessment area cooperatively with Madison County and other agencies, landowners and partners as

appropriate. Continue the existing education effort on weed identification and prevention measures with people who use this area.

10. Continue with the implementation of the Bear Trap Wilderness Weed Management Plan.
11. Work with Montana FWP to further educate river users in the methods to stop the spread of invasive species (e.g. whirling disease, New Zealand mud snails, Eurasian water milfoil) either into the Madison or from the Madison to another body of water.
12. Due to the size and density of the leafy spurge infestations, focus control toward containing it within the areas already infested by using biological control, to reduce density and vigor of large infestations. Focus herbicide treatments on areas most likely to contribute to spread (i.e. roads, trails and washes). Continue integrated weed management on the Flying D allotment and BLM administered recreation sites along the Madison River.
13. Work with office staff to setup monitoring plots within Spiny skeletonweed and Railhead milkvetch populations to determine a method of treatment for the noxious weeds threatening them that will reduce the weed densities with minimal impact on the special status plants.
14. Continue the treatment of houndstongue in the Axolotl cabin area and explore the options for a volunteer spray/pull day.
15. Explore opportunities to restore/improve whitebark pine habitats.
16. Explore opportunities to increase diversity of seral stages and structure in forested habitats.
17. Explore opportunities to recover the economic value of dead/dying timber resource.

Additional Issues and/or Concerns

Wildland Urban Interface

The wildland-urban interface (WUI) is defined in the Dillon RMP as the line, area or zone where structures and other human developments meet or intermingle with undeveloped wildland or vegetative fuels. During the 2009 field assessment, the IDT observed scattered permanent homes and seasonally-used cabins throughout the MW that are considered to be in the WUI. The community of Pony is the largest concentration of residences near BLM-administered forested land. Both historic and recently constructed structures in the Pony area are in the WUI. High fuel loads on BLM adjacent to the Sun West Ranch subdivision was also noted as a WUI concern. In the event of a wildfire, fuel reduction projects and adequate survivable space around structures improve the chances of withstanding a wildfire unharmed. The mixed ownership of privately owned land and BLM administered land limits large-scale fuel reduction projects on most BLM lands,

Example of WUI in the Strawberry Ridge area; July 2009

unless in cooperation with private landowners.

Recommendation

1. Pursue opportunities to treat hazardous fuels WUI areas. Continue fire education and mitigation efforts in local communities.

Bear Trap Wilderness and Axolotl Lake WSA

Unauthorized livestock use along the Trail Creek/Pot Trail has been an issue impacting the wilderness and primitive recreation opportunities within the Bear Trap Wilderness in the past. However, recent management changes have mitigated this to some degree. Human-caused fires within the wilderness have burned repeatedly in the area of Bear Trap Creek, resulting in loss of timber replaced by large areas of noxious weeds (mostly knapweed and cheatgrass). Motorized vehicle use was also identified as a possible issue within the wilderness for administration of the Red Bluff Custodial grazing allotment and for access to the Bear Trap repeater.

The assessment team indentified motorized vehicle use, firewood cutting, and impacts associated with the administration of the Baldy Mountain repeater as issues of concern within the Axolotl Lakes WSA.

Recommendations

1. Work with the USFS to improve management and reduce unauthorized use by livestock on the Trail Creek AMP allotment affecting the Bear Trap wilderness area.
2. Create and/or modify agreements as necessary with the Red Bluff Station and operators of the Bear Trap and Baldy Repeaters to identify acceptable options for accessing these sites.
3. Close the Bear Trap Canyon Wilderness Area to open fires yearlong.

Travel Management

As a result of the 2006 Dillon Field Office RMP, public motorized wheeled vehicle use is limited to those routes designated as open. All other routes are considered closed, with few exceptions to accommodate administration of permits, to access private lands, or other limited circumstances. The field assessment for this watershed showed that several of the designated routes identified to be open to public motorized use are inaccessible to the public because of posted private lands. Other routes not designated open appear to have been overlooked or omitted as simple mapping errors.

Recommendation

1. Analyze, and make necessary adjustments to route designations where concerns were documented.

Recreation

Revenue Flats has been a popular location for camping and rock climbing for many years. Use numbers in the area continue to increase annually, the remote location often attracting a “party crowd” expecting to be undisturbed by law enforcement presence and prone to resource-destructive activities. Although law enforcement has been increased in recent years, there continue to be problems with off-road vehicle use, littering, sanitation, and destruction of trees

and vegetation. Similar problems are occurring in the Cataract Lake area on BLM lands west of Pony,

Big game hunting season attracts recreationists from throughout the country to hunt elk, deer, and antelope on most BLM lands in the Madison Valley. Off-road vehicle use is the greatest challenge to recreation management during this time.

Recommendation

1. Work with law enforcement to reduce unauthorized ATV and vehicle use and unauthorized use and destruction of trees by public lands recreation users, primarily in the Revenue Flats area.

Grazing Management and Allotment Administration

As part of the MW assessment process the BLM will consider a wide range of administrative options to more efficiently manage BLM administered public lands in the watershed. Management actions regarding allotment divisions, removing private land from grazing allotments, grazing authorization changes based on base property ownership, rescinding grazing leases on allotments no longer in use, and changing the management designation from un-leased to un-allotted on some tracts will be considered and analyzed in the Madison Watershed EA in 2010. Also, revising the AMP and/or management designation category will be considered for some allotments that are currently authorized as Custodial and operating without an AMP.

Recommendations

1. Consider designating the Story property recreation site, formally the Riverside grazing allotment, un-allotted.
2. Consider retiring the grazing lease for the Madison Valley Holding Pasture in the Palisades recreation area.
3. Consider dividing the Maltby's Mound allotment based on changes in base property ownership.
4. Consider transferring preference on the Sitz allotment based on base property ownership.
5. Consider adjusting the season of use for the Gustin AB pasture in the Axolotl Lakes allotment.
6. Consider removing 320 acres of isolated private property from the Michel allotment.
7. Review the Cooperative Agreement with University of Montana Research Station for grazing use on the Red Bluff allotment.

Abandoned Mine Lands

In mineralized areas of the watershed, there has been mining activity over the past 150 years. Mining prior to 1981 did not require reclamation or bonding, so many of the abandoned mines have legacy features, such as eroding dumps, abandoned tailings, or open mine features. The IDT noted numerous features associated with the historic mining such as adits, shafts, waste dumps, dredge piles and other associated features. The BLM continues to make progress in addressing mine features on BLM administered lands to insure public safety and protect the environment. The Montana Boy mill site is located approximately three miles south of Norris near Bradley Creek. It consisted of a small mill that was constructed in the 1980's but never

operated. Before the site was completely reclaimed, the operator passed away. BLM recently completed cleanup and reclamation of the site.

The State of Montana is scheduled to remediate historic mill tails at a site known as the Garnet Mine and Mill. It is located almost entirely on patented land and sits just below Cataract Lake, about three miles west of Pony.

The AML program is an ongoing program which has been addressing legacy mining issues throughout southwest Montana. AML work will continue until all environmental and physical safety issues that can be resolved have been completed. Reclamation will be prioritized by the magnitude of the environmental problem, the severity of the safety risk, funding available, and/or the partnerships available to conduct the work.

Recommendation

1. Continue addressing legacy mining issues within the MW through the AML program.

Interdisciplinary Team Composition

Core IDT members:
Steve Armiger, Hydrologist/Riparian Coordinator
Katie Benzel, Wildlife Biologist
Kipper Blotkamp, Fire Ecologist
David Early, IDT lead, Rangeland Management Specialist
Pat Fosse, Assistant Field Manager for Renewable Resources
Paul Hutchinson, Fisheries Biologist
Aly Piwowar, Forester

Support IDT members:
Laurie Blinn, GIS Specialist
Bob Gunderson, Geologist/Mining
Brian Hockett, Special Status Species-Plants
Susan James, Recreation Planner
George Johnson, Fire Management Specialist
Michael Mooney, Weeds Specialist
Jason Strahl, Archeologist
Rick Waldrup, Recreation Planner

Other support personnel:
Floyd Thompson, Montana/Dakotas BLM Range Program Lead
Kelly Urresti, Range Technician
Steve Lubinski, Range Technician
Roger Olsen, Range Technician
Lindsey Wilsey, Range Technician
Kate Given, Administrative Assistant
Ellen Daugherty, Administrative Assistant

Glossary

Adit: a nearly horizontal passage from the surface in a mine.

Allotment: an area of land designated and managed for grazing of livestock.

Allotment Management Plan (AMP): a documented program developed as an activity plan that focuses on, and contains the necessary instructions for, the management of livestock grazing on specified public lands to meet resource conditions, sustained yield, multiple use, economic and other objectives.

Alluvium: clay, silt, sand, gravel or similar detrital material deposited by running water.

Animal unit month (AUM): amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month.

Area of Critical Environmental Concern (ACEC): Areas within the BLM administered lands where special management attention is required to: (1) protect and prevent irreparable damage to important historic, cultural or scenic values, fish and wildlife resources, or other natural systems or processes, or (2) protect life and safety from natural hazards.

Axolotl: A neotenic form of tiger salamander that has gills and an aquatic lifestyle from living in a cold, relatively sterile environment, with no fish.

Breccia: a rock composed of sharp fragments embedded in a fine grain matrix (as sand or clay).

Climax plant community: The final or stable biotic community in a successional series; it is self-perpetuating and in equilibrium with the physical habitat.

Ecological site: A kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Endemic: a population of potentially injurious plants, animals, or viruses that are at low levels

Epidemic: pertaining to populations of plants, animals, and viruses that build up, often rapidly, to unusually and generally injurious high levels – *synonym* outbreak – *note* many insect and other animal populations cycle (periodically or irregularly) between endemic and epidemic levels

Fellfield: A community of dwarfed, scattered plants or grasses above the timberline where the dynamics of frost (freeze and thaw cycles) and of wind give rise to characteristic plant forms.

Fen: A type of wetland fed by surface and/or groundwater. Fens are characterized by their water chemistry, which is neutral or alkaline.

Forest land: land that is now, or has has the potential of being, at least 10 percent stocked by forest trees (based on crown closures) or 16.7 percent stocked (based on tree stocking).

Frazil Ice: A collection of loose randomly oriented needle-shaped ice crystals in water. It resembles slush and has the appearance of being slightly oily when seen on the surface of water. It sporadically forms in open, turbulent, super-cooled water, which means that it usually forms in rivers, lakes and oceans, on clear nights when the weather is colder, and air temperature reaches – 6°C or lower.

Functional at risk (FAR): riparian wetland areas that are functional, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

Hydric soil: soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrophyte: plants growing in water or on a substrate that is at least periodically deficient in oxygen due to excessive wetness.

Hydrologic Unit Code (HUC): The USGS has developed a system of geographic units based upon watersheds and assigned numbers to correspond to the units. These units were originally subdivided to four levels. Subsequently two additional subdivisions have been developed. Currently there are six levels, with the sixth being the smallest unit. The Missouri river is in Region 10. The Madison River is in Subregion 1002, Missouri Headwaters.

Lentic: standing or still water such as lakes and ponds.

Lotic: flowing or actively moving water such as rivers and streams.

Moraine: Accumulated glacial debris - a mass of earth and rock debris carried by an advancing glacier and left at its front and side edges as it retreats.

Neotenic: Retention of juvenile characteristics in adults of a species, as among certain amphibians.

Nonpoint source pollution (NPS): Pollution originating from diffuse sources (land surface or atmosphere) having no well defined source.

Obligate wetland species: plant species that occur almost always under natural conditions in wetlands.

Pedestal: Plants or rocks that appear elevated as a result of soil loss by wind or water erosion.

Palustrine: from the Latin "palus" or marsh. non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens.

Proper functioning condition (PFC): Lotic riparian-wetland areas are considered to be in proper functioning condition when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high waterflows, reducing erosion and improving water quality;
- Filter sediment, capture bedload, and aid floodplain development;
- Improve flood-water retention and ground-water recharge;
- Develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses;
- Support greater biodiversity

Riparian zone: the banks and adjacent areas of water bodies, water coursed, seeps, and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a moister habitat than that of contiguous flood plains and uplands.

Rosgen Classification System: The Rosgen system classifies streams at five levels. Level I is a broad level delineation that takes into consideration landform, landscape position, slope, and profile. Streams are classified at this level using aerial photographs and maps. The Level II was developed by Rosgen using reference reaches, i.e. stable stream reaches. Dimensions, patterns and profiles are measured to develop Level II. Field guides have been published to make field determinations at this level. Classifying streams to Level III, IV and V is beyond the scope of this document.

Total Maximum Daily Load (TMDL): The goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Under section 303(d) of the CWA, states are required to develop lists of impaired waters. The law requires that states establish priority rankings for waters on the lists and develop TMDLs for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

TMDL Planning Areas: Montana DEQ is using a watershed approach to address TMDLs based on the premise that water quality restoration and protection are best addressed through integrated efforts within a defined geographic area. DEQ has divided the state into 91 watershed planning areas to facilitate development of TMDL/water quality restoration plans.

Seral: of, relating to, or constituting an ecological sere

Sere: a series of ecological communities that succeed one another in the biotic development of an area or formation.

Spring brook: a channel that carries water from a spring. Where there is sufficient flow, the channel forms a perennial stream. Frequently in arid environments, the flow is insufficient to create a perennial stream. Groundwater emerges at the springhead, flows a short distance within the spring brook, and then submerges.

Watershed: Geographic areas delineated per the federal protocol for hydrologic units. The Madison Watershed as described in this document includes two of the 5th level of the hydrologic unit hierarchy: the Middle Madison and the lower Madison. The Middle Madison begins just below Quake Lake and continues to Ennis Lake. The Lower Madison unit begins below Ennis Lake and continues to its confluence at Three Forks. The unit was cut off at the Madison County line in the vicinity of Black's Ford.

Woodland: forest communities occupied primarily by noncommercial species such as juniper, mountain mahogany, or quaking aspen groves. All western juniper forest lands are classified as woodlands, since juniper is classified as a noncommercial species. Woodland tree and shrub canopy cover varies, but generally individual plant crowns do not overlap.

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